The Electrical Industry's Weekly Magazine

May 13, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication

How PEPCO serves 452-Suite Building for Better Living

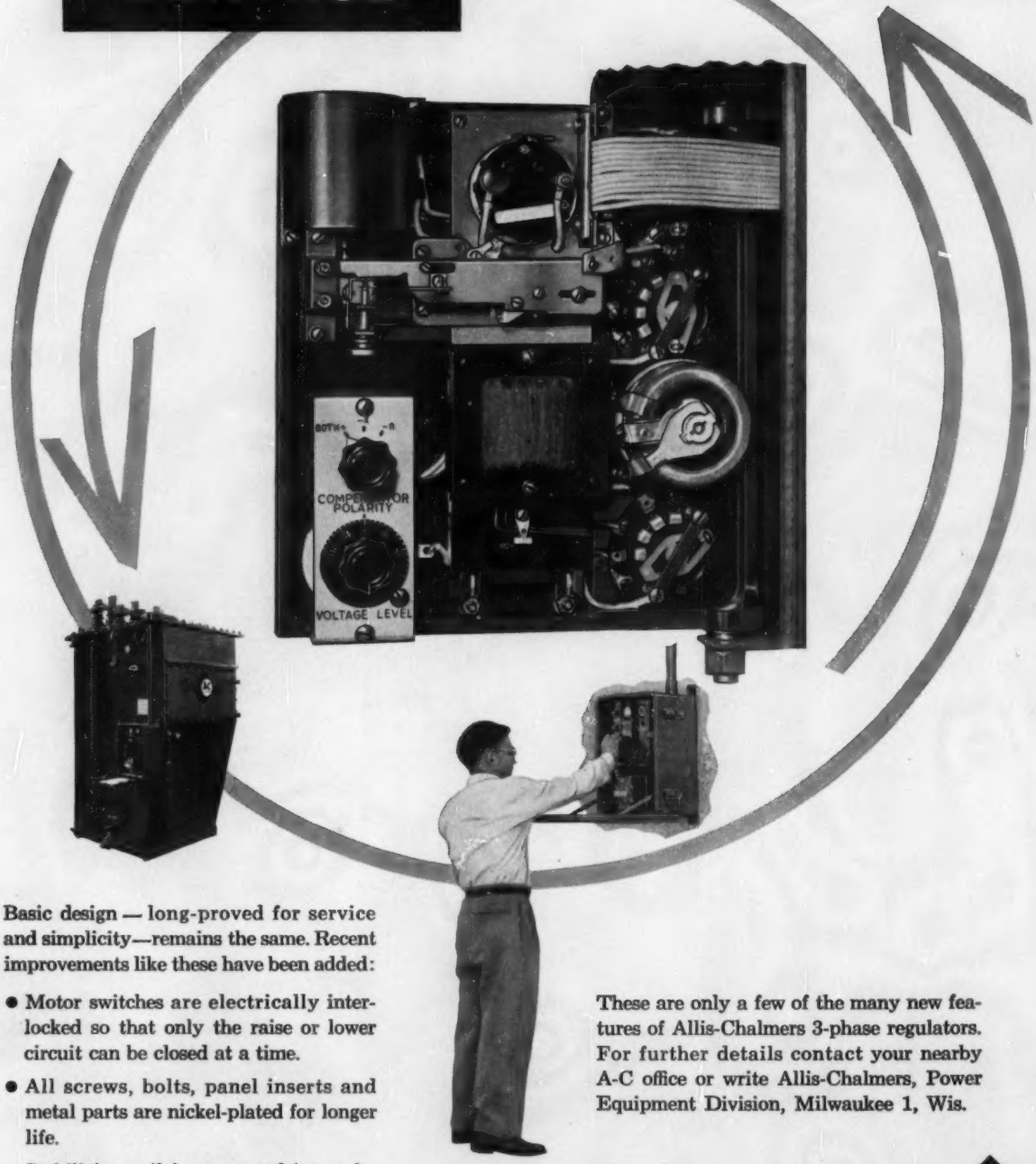
...Page 90

Credit Men Tighten the Screws . . . Page 76

E B POWER GS W 1
UNIVERSITY MICROFILMS I
313 N 1 ST
ANN ARBOR MICH

continued improvements in 3-phase regulators

CONTROL



Basic design — long-proved for service and simplicity—remains the same. Recent improvements like these have been added:

- Motor switches are electrically interlocked so that only the raise or lower circuit can be closed at a time.
- All screws, bolts, panel inserts and metal parts are nickel-plated for longer life.
- Stabilizing coil incorporated into solenoid of voltage-regulating relay.
- Rustproof plastic coating on open edges of control cabinet.
- Handy control diagram on inside cover.

These are only a few of the many new features of Allis-Chalmers 3-phase regulators. For further details contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS

A-5408

Electrical World

Vol. 147, No. 19 MAY 13, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

Credit Men Tighten the Screws

Utilities are taking firmer measures to prevent bad-debt losses. But it is a job with pitfalls.....p 76

Fitzwater Named President at Indianapolis

He got his first utility job at age 11. Now the Indianapolis P&L Co treasurer moves up to the top spot.....p 81

INDUSTRIAL

Grid in Floor Heats Warehouse

Reinforcing rods in concrete serve as heating elements for 900-kw system in Commonwealth Edison structure....p 86

SUBSTATIONS

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Substantial economic benefits warrant prediction of continued trend in application to large transformers.....p 88

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Study by Oklahoma G&E Co of 24-sq mile area reveals that annual costs for 75-Mva stations are 25% lower.....p 92

DISTRIBUTION

Serves All-Electric Living

Washington, D. C., apartment building with 452 suites has largest service entrance of any such building.....p 90

GENERATION

BF Pump Fixes Auxiliary Design

Power system for supercritical pressure unit must supply 9.4 Mw for boiler feed pump requirements.....p 96

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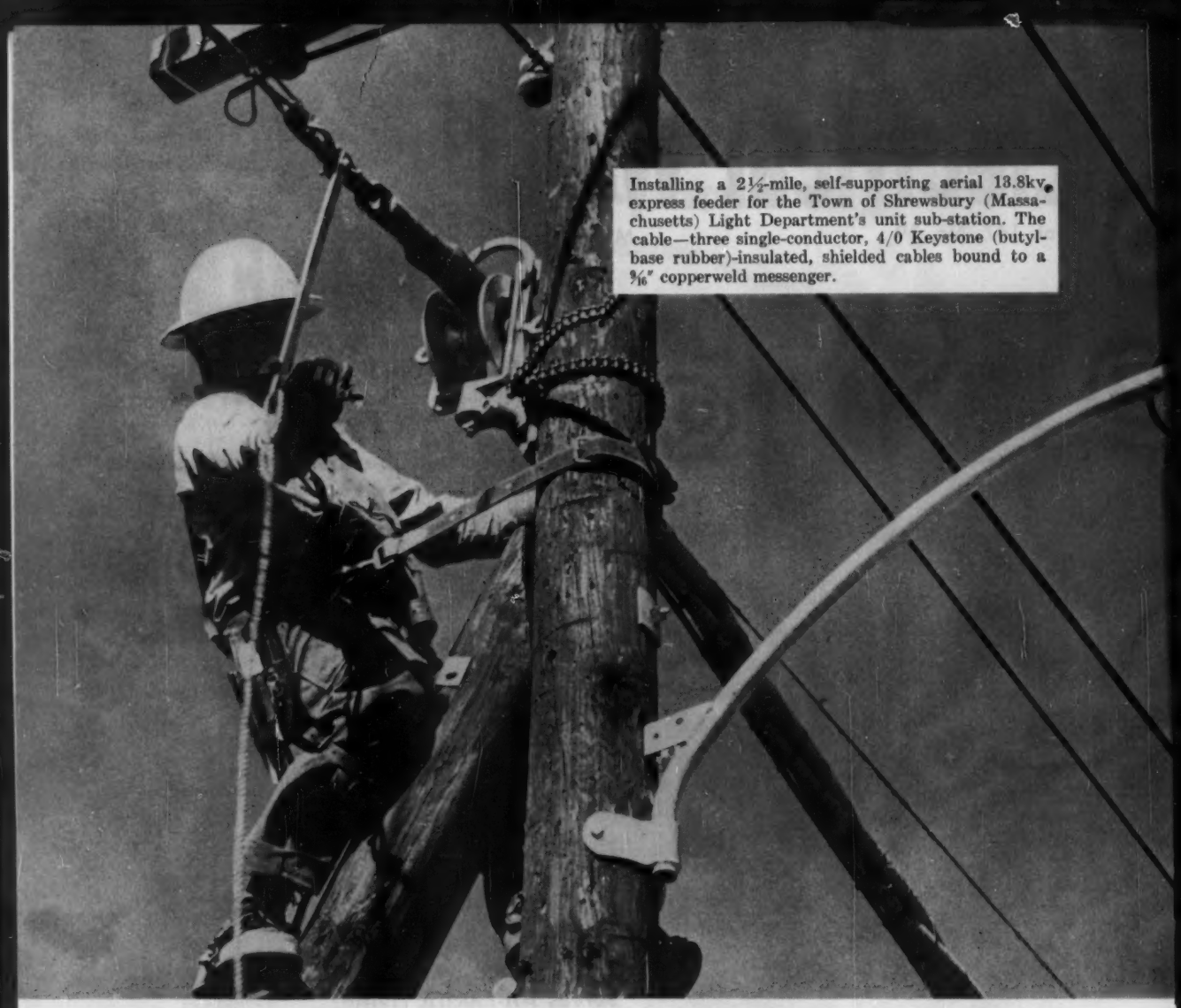

Installing a 2½-mile, self-supporting aerial 13.8kv express feeder for the Town of Shrewsbury (Massachusetts) Light Department's unit sub-station. The cable—three single-conductor, 4/0 Keystone (butyl-base rubber)-insulated, shielded cables bound to a 9/16" copperweld messenger.

Contractor: The Theodore D. Bross Line Construction Company

Modernize with Okonite self-supporting aerial cable...

The Town of Shrewsbury Light Department did just this when they recently installed a 13.8kv express feeder. They chose an Okonite self-supporting aerial cable because they wanted a superior installation that would practically eliminate tree trimming costs . . . be more reliable in storms (operate even with poles down) . . . reduce pole congestion . . . assure fewer interruptions or outages . . . have a moderate cost . . . provide improved voltage regulation because of lower reactance . . . and be more economical to operate and maintain than equivalent open wire lines.

In choosing Keystone (butyl-base rubber)-insulated cables for this important feeder, Shrewsbury Light Department was also banking on high voltage cable with a record for long and dependable service . . . high resistance to ozone and corona cutting . . . ability to take sharp bends . . . stable operation at copper conductor temperatures as high as 85C at 15kv . . . excellent resistance to moisture and extremes of temperatures.

For the complete story on Keystone-insulated cables, contact your Okonite representative . . . or write for Bulletin EW-463 where the results of field service and tests are reported with graphs and charts together with 36 pages of technical data.

The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

4912

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. . . *from the publisher*

One of the first journalistic axioms a cub reporter learns is that names make news.

This is borne out week after week here at Electrical World where surveys show our News About People section (page 172) is repeatedly the most read feature of the magazine. In the course of a year some 3,000 names and pictures appear in News About People . . . items about promotions, transfers, and deaths. It serves as a sort of "who's who" and "who did what" for the industry.

Most of these writeups bring the subject the usual notes, wires, and phone calls from well-wishers. But getting your name into print can sometimes have an unusual twist.

To one recently advanced utilityman came a letter bearing a Pakistan stamp and a check for $25—a debt settlement from an old pal who had lost track of him until reading his item in NAP. To another came a box with a battered slide rule, a wing-tip tux collar, and a tattered WPA job manual a college classmate had borrowed years before.

To serve this way as a worldwide personal exchange post is an unexpected but highly welcome job. If you're not already doing so, keep us informed of the changes and additions in your organization. Let's publicize them.

Fischer Black

ELECTRICAL WORLD

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NOW!...*Finally!*...Here's a method all wrapped up in

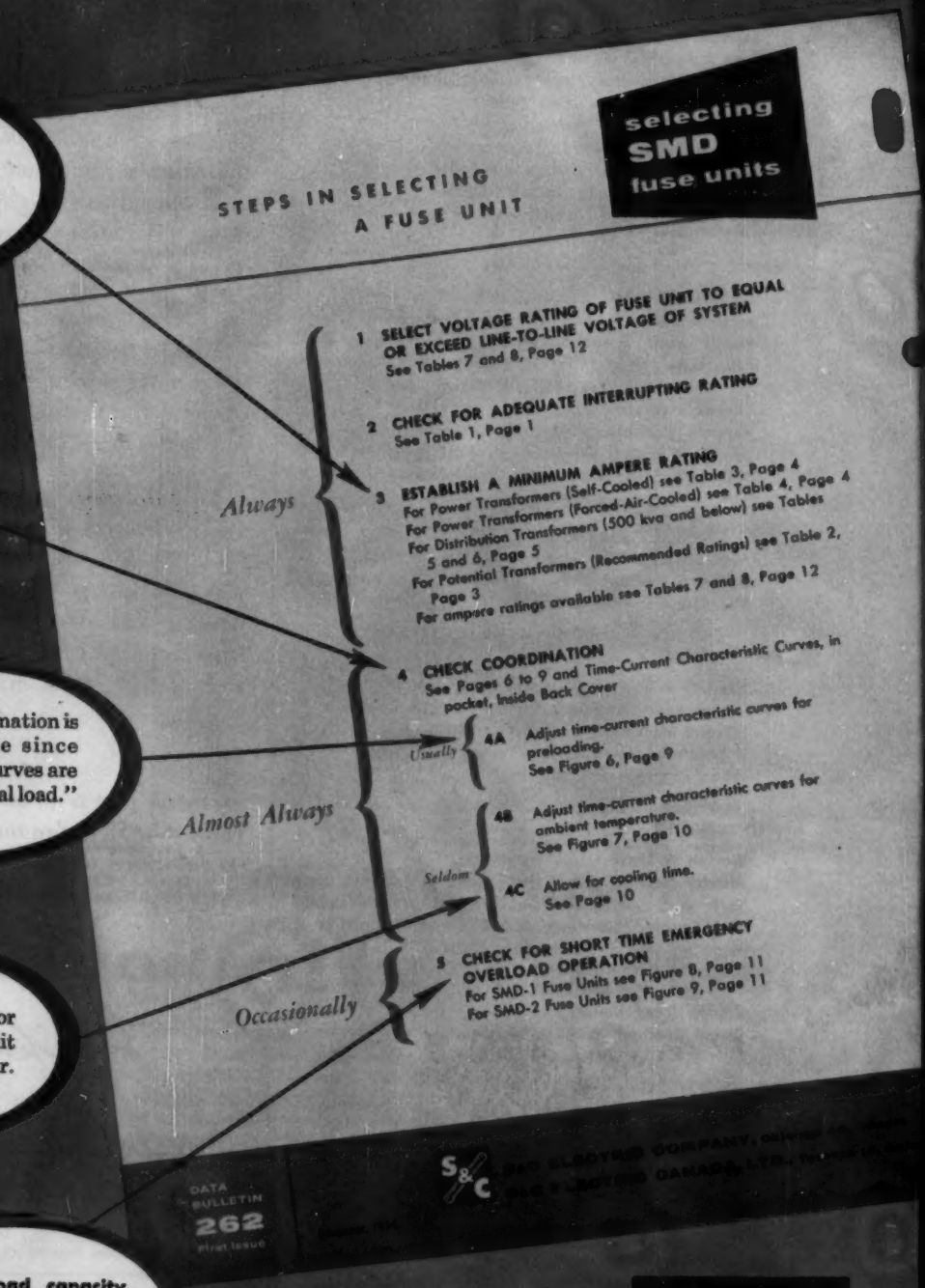
New ampere rating recommendations give maximum protection for transformers with precise allowances for short-time daily overloads.

Two methods of coordination are offered: Rule-of-thumb and Precision.

Preloading information is made available since Time-Current Curves are based on "no initial load."

How to compensate for successive short-circuit operations of the breaker.

Fuse overload capacity information is given here for the first time anywhere.

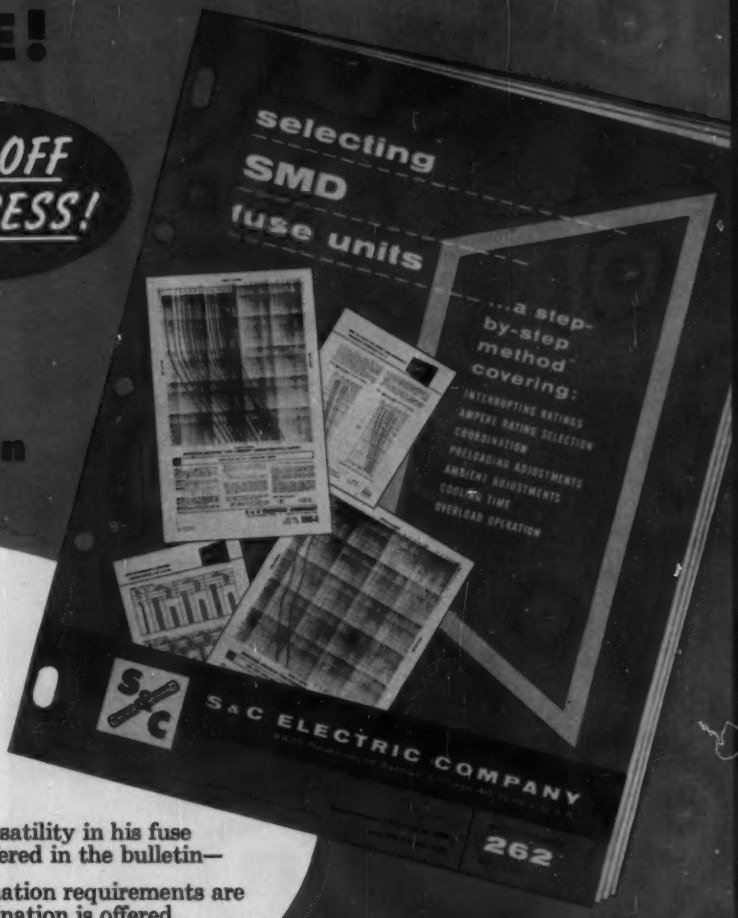

selecting SMD fuse units
STEPS IN SELECTING A FUSE UNIT
1 SELECT VOLTAGE RATING OF FUSE UNIT TO EQUAL OR EXCEED LINE-TO-LINE VOLTAGE OF SYSTEM
See Tables 7 and 8, Page 12
2 CHECK FOR ADEQUATE INTERRUPTING RATING
See Table 1, Page 1
Always
3 ESTABLISH A MINIMUM AMPERE RATING
For Power Transformers (Self-Cooled) see Table 3, Page 4
For Power Transformers (Forced-Air-Cooled) see Table 4, Page 4
For Distribution Transformers (500 kva and below) see Tables 5 and 6, Page 5
For Potential Transformers (Recommended Ratings) see Table 2, Page 3
For ampere ratings available see Tables 7 and 8, Page 12
4 CHECK COORDINATION
See Pages 6 to 9 and Time-Current Characteristic Curves, in pocket, Inside Back Cover
Almost Always
Usually
4A Adjust time-current characteristic curves for preloading.
See Figure 6, Page 9
Seldom
4B Adjust time-current characteristic curves for ambient temperature.
See Figure 7, Page 10
4C Allow for cooling time.
See Page 10
Occasionally
5 CHECK FOR SHORT TIME EMERGENCY OVERLOAD OPERATION
For SMD-1 Fuse Units see Figure 8, Page 11
For SMD-2 Fuse Units see Figure 9, Page 11
DATA BULLETIN 262 First Issue
S&C

S&C

for power fuse coordination ONE PACKAGE!

JUST OFF THE PRESS!

it frees you from hocus-pocus; it gives you more fuse protection



The key to this method is a step-by-step sequence as shown at the left (the first inside page of the new Data Bulletin 262).

For each step, all the necessary data is at your finger tips. You have a choice of two methods—

for the man who wants more range and versatility in his fuse coordination, a "precision" technique is offered in the bulletin—

for the man-on-the-go, whose fuse coordination requirements are not so rigorous, the "rule-of-thumb" coordination is offered.

Write today for your copy of this 12-page-plus-cover Data Bulletin 262, with necessary TCC curves.

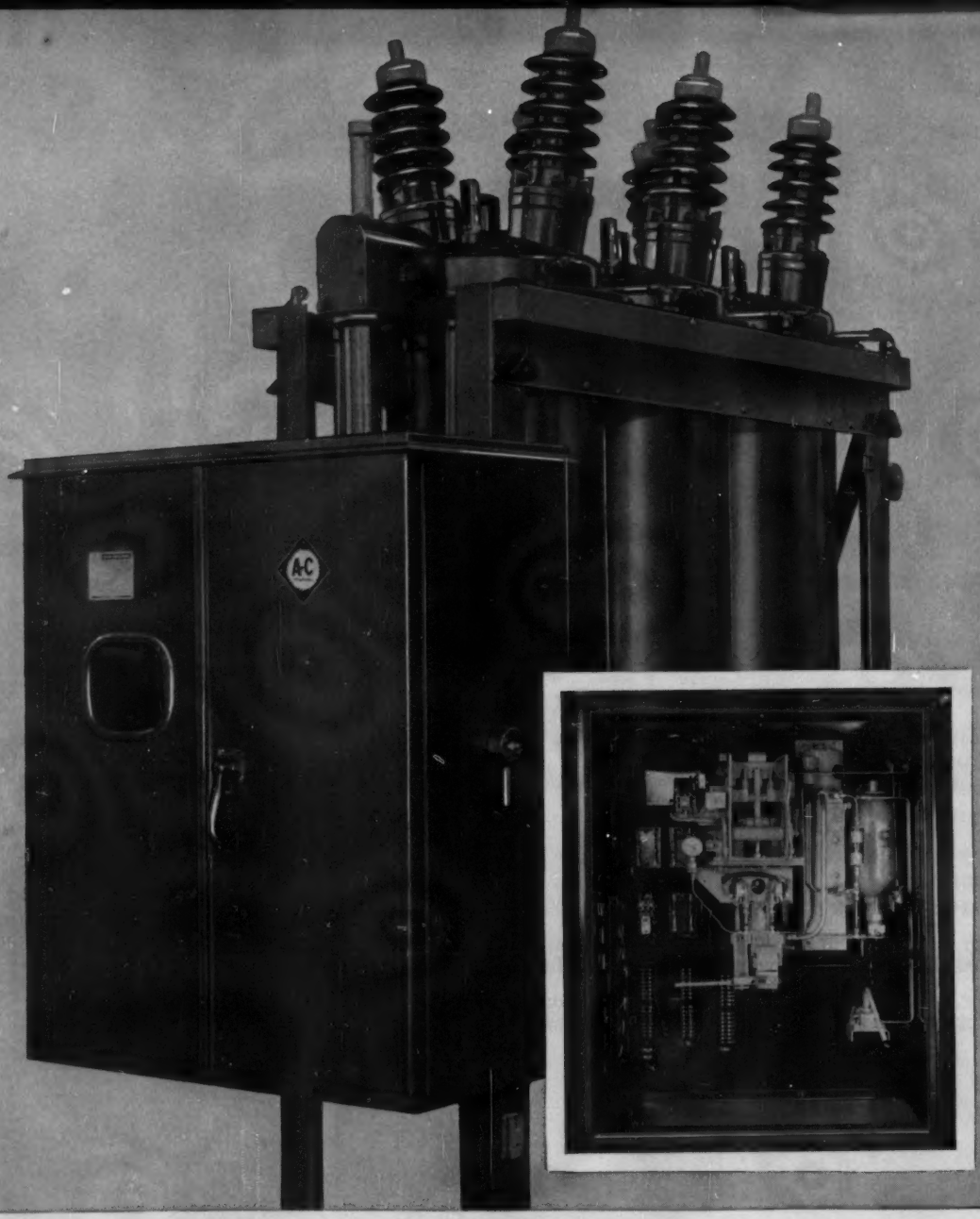
S & C Power Fuse Type SMD, illustrated below: vertical style 69 kv.

Specialists in High-Voltage Circuit Interruption Since 1910

S&C ELECTRIC COMPANY

In Canada: S & C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR



Now Pneu-Draulic Operators

At the request of numerous utilities, Allis-Chalmers design engineers have now made available to you *Pneu-Draulic* operators on smaller breakers.

Enjoy the simplicity and reliability of the *Pneu-Draulic* operator on your next breaker.

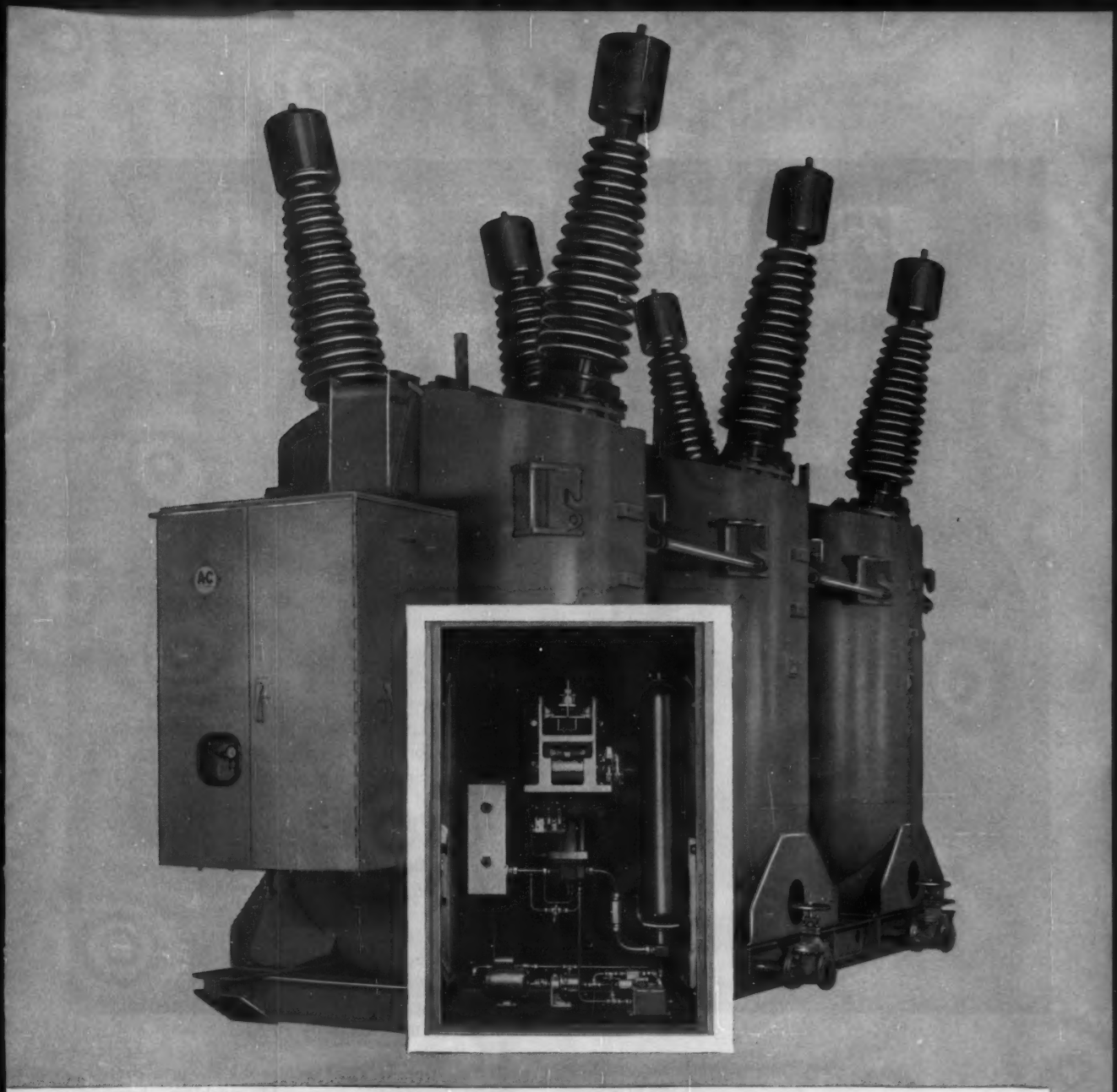
Acceptance of the *Pneu-Draulic* operator is based on the fact that it's as simple as it looks. It eliminates the mechanical problems inherent in previous mechanisms.

For complete information call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is a registered Allis-Chalmers trademark.

LIVE BETTER ELECTRICALLY

ALLIS-



for Breakers 500 Mva and Larger

Features of *Pneu-Draulic* Operator

- Simple — Has fewer parts than other types of operating mechanisms.
- Eliminates moisture, corrosion, dust problems — entire system filled with oil containing inhibitor. Filtering eliminates dirt problem.
- Provides emergency closing — can be closed safely onto energized line when no control power is available.
- Mechanically trip-free.

CHALMERS

A-C ALLIS-CHALMERS

A-5131

For a Contact– or a Complete Sub-Assembly... See Mallory

Mallory offers you the savings and convenience of a single source for a simple contact —or a complete contact sub-assembly.

As Mallory has done for many manufacturers, we can consult with your engineers on a contact problem—solve the problem—design the contact element for easy inclusion in an assembly—and, if you want, build the entire sub-assembly for you.

Into this service goes all of Mallory's long experience in the contact field. Mallory metallurgy has equipped them with the best of materials and know-how, for the contact itself—for the backing metal—for design of the housing and for assembly techniques.

The pictured assembly was designed in cooperation with a leading electrical equipment manufacturer. The contacts, conductors, terminal points and the molded plastic case are all cooperative products of Mallory and the customer's engineering and manufacturing abilities. The contact material, Mallory D-54®, permitted the customer's product to pass Navy tests—and at the same time reduced costs by 15%.

So if yours is a contact problem—or a complete contact sub-assembly problem—bring it to Mallory. A single source can expedite your supply and minimize your scheduling problems. Write, or contact the Mallory representative—today, for literature or a consultation.

Expect more...get more from

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc. INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

Hubbard 4-11-44 Wireholders

The First...and still the Finest

Smoothly rounded surfaces of large radius provide safe loop for conductor and protection to insulation on wiring.
No. 4-11-44 has ⅜" x 1" diameter hole. No. 7-11-77 has 1¼" diameter hole.
Heavy, snug-fitting Copperweld bail absorbs all the tension, relieves danger of porcelain breakage. Corrosion resistant Copperweld maintains full strength for entire life of wireholder.
HUBBARD
Base of heavy gauge, double-dip hot galvanized steel to withstand corrosion for long service life. Specially designed to grip the bail tighter as tension increases.
Special screw threaded entire length to base, for maximum holding power even in thin material.
Also available in toggle bolt, carriage bolt and various screw lengths.
Sharp, clean-cut threads narrow to fine point for easy starting, fast driving.

More than 40 years ago, Hubbard and Company pioneered a wireholder based on tension being absorbed by a wire bail, with porcelain required for insulation only. This design has since become . . . "the most popular wireholder ever made."

Sold exclusively through Electrical Distributors

HUBBARD AND COMPANY • 6301 BUTLER STREET, PITTSBURGH 1, PA.

Chicago, Illinois
Oakland, California
Plano (Dallas), Texas

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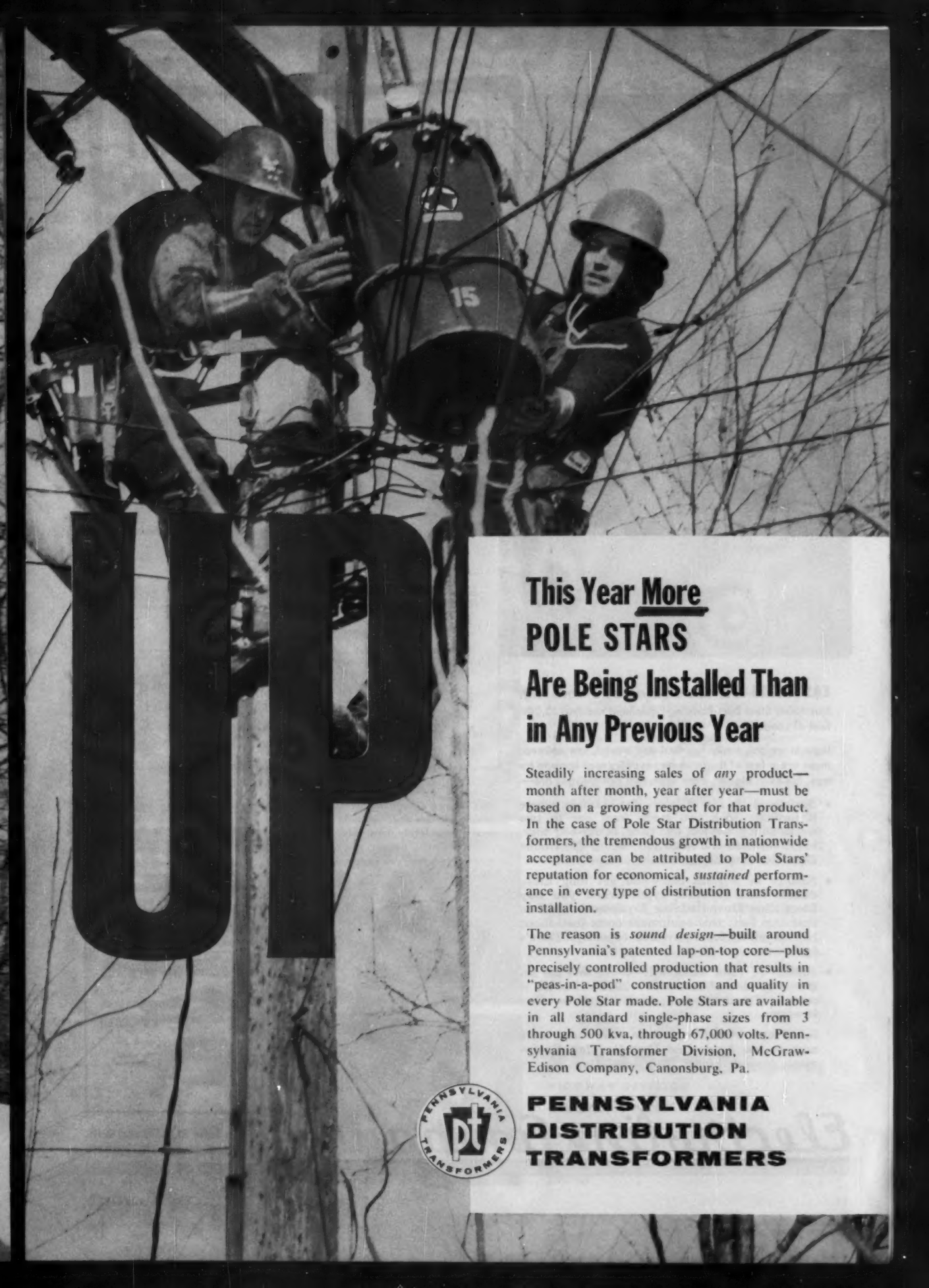


This Year More POLE STARS Are Being Installed Than in Any Previous Year

Steadily increasing sales of *any* product—month after month, year after year—must be based on a growing respect for that product. In the case of Pole Star Distribution Transformers, the tremendous growth in nationwide acceptance can be attributed to Pole Stars' reputation for economical, *sustained* performance in every type of distribution transformer installation.

The reason is *sound design*—built around Pennsylvania's patented lap-on-top core—plus precisely controlled production that results in "peas-in-a-pod" construction and quality in every Pole Star made. Pole Stars are available in all standard single-phase sizes from 3 through 500 kva, through 67,000 volts. Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

PENNSYLVANIA TRANSFORMERS pt

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

10,000 FEET OF CONDUIT RODDED IN 8 HOURS!

Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.

EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

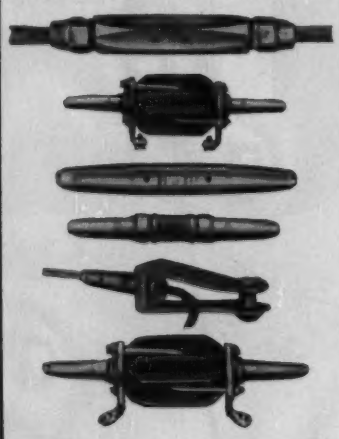
Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.

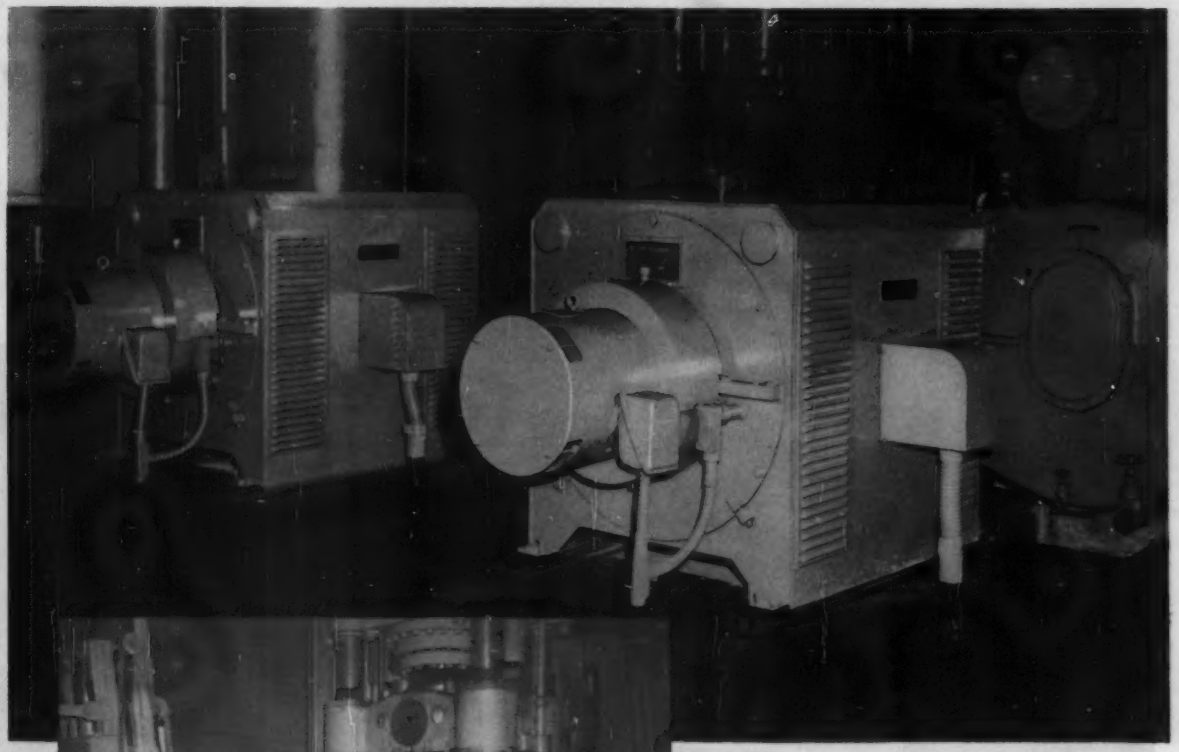
OTHER *Electroline* PRODUCTS

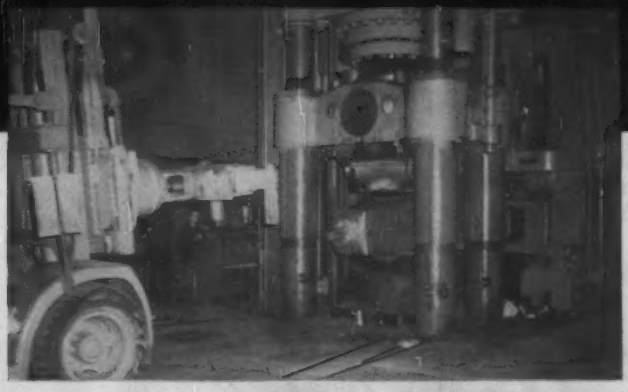


Electroline Company

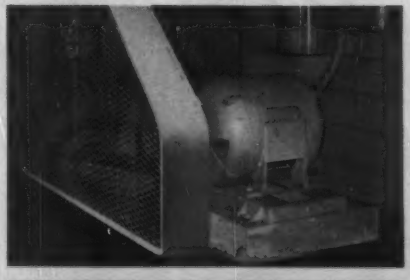
4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO

Elliott motors provide **dependable** drives for hydraulic forging press pumps!

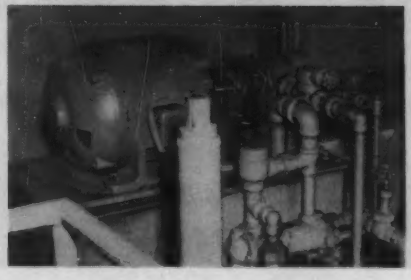




The above forging press is powered by hydraulic pumps which are driven by two Elliott 600-hp, 1200-rpm synchronous motors in the large photo above.



A horizontal air compressor seen on the right is driven by an Elliott C-W 40-hp motor.



This Elliott C-W 5-hp, 1160-rpm motor drives the oil servo pumps for the press controls.

The only modern forging press in the United States designed primarily for forging tool steel and high temperature alloys is seen at the left. This powerful press delivers over 100 blows per minute—and each blow is equal to 2000 tons.

Elliott synchronous motors above, are the *driving power* behind this complex operation which involves six men, four heating furnaces, an annealing furnace, a charger, a manipulator, a 40-ton crane, and other equipment in addition to the water pumping unit.

Vital to the successful and uninterrupted performance of the whole operation are Elliott motors which drive the hydraulic pumps to provide power for the forging press. And once again, Elliott motors demonstrate their superior quality by providing dependable and efficient driving power. For literature giving a complete discussion of construction details, call your nearby Elliott District Office, or write . . .

ELLIOTT Company

RIDGWAY DIVISION

RIDGWAY, PA.

R7-6

"Red Tape"

Westinghouse
KILOWATT HOURS
TYPE DS
60
15 AMPS
SINGLE PHASE
Westinghouse
INTERVAL
RECORDER NUMBER

saves you money

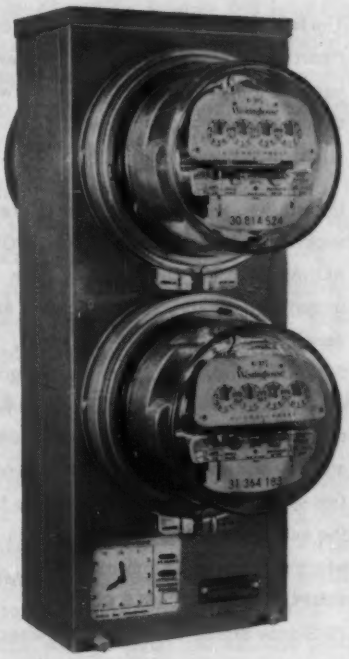
Exactly! It's magnetic recording tape in the new Westinghouse Load Survey Meter

The new Westinghouse Load Survey Meter uses the principle of automation. It gets the same results . . . higher production from fewer man-hours.

Essentially, the meter is a tape recorder that translates consumer demand indicated by the watthour meter into "intelligence" on the tape—at the maximum rate of 240 demand impulses per interval. The 600-foot tape runs a full 32 days. The tape then is "played back" through a special translator in conjunction with an IBM 526 Printing Summary Punch. In 35 minutes the translator and card punch can deliver a record for the month on punched and printed IBM cards. No engineers, clerks or card-punch operators are involved.

Compare this operation with current methods which require two interpreters for each six recording charts per day—plus an IBM operator—just to read the record and put it in usable form.

The new Westinghouse Load Survey Meter is a truly practical tool. It saves you money in the process of giving you accurate information on which to plan more efficient generation and distribution systems. Complete details are available from your Westinghouse sales engineer—or from Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, Pennsylvania. J-40490



"Double unit, allowing customer's billing meter to remain in service (upper meter) while load is recorded by means of lower meter, which contains the contact device."

YOU CAN BE SURE...IF IT'S

Westinghouse

"It's Everybody's Family Tree!"

The familiar utility pole might well be considered "part of the family". Through the years it has supported the wires that bring light, warmth, communication and labor-saving energy into every home.

In countless locations, these wires are being supplanted by SIMPLEX SELF-SUPPORTING AERIAL CABLES, which have built an unmatched reputation for efficiency and dependability. For sixty-seven years, Simplex has pioneered in the design, development and manufacture of all types of aerial cables used for both communication and power distribution. The benefits of this specialized experience are yours for the asking. Write for Catalog 1006, which gives detailed information.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street, Cambridge 39, Mass.

LIVE BETTER ELECTRICALLY

Simplex

Wire sculpture by Henry Szafarz

Anhydrex Insulated, Neoprene Jacketed, Self-Supporting Aerial Cable

NEWS-SCOPE

FUTURE NEWS ▶ **Fast tax write-off program may be amended by Congress** to apply strictly to defense plants. That's the direction being charted by Treasury Secretary Humphrey and Virginia Senator Byrd.

FPC has stiffened its back against pressure from Interior Department in deciding the Pleasant Valley case. Pacific Northwest Power Co applied for a license to build a project at the Pleasant Valley site, but the FPC staff and Interior want it elsewhere.

Details of England-France channel submarine cable to be revealed soon. Cable will probably be 31-mi long, dc, 200,000-v, and cost an estimated $11 million. Both terminals will have mercury. ARC converters to restore the power to ac for transmission.

LATE NEWS ▶ **"Further investment in TVA should be halted,"** Walter H. Sammis, president, Ohio Edison Co, speaking for the private electric utility industry, and Louis V. Sutton, president, Carolina Power & Light Co, speaking for the U. S. Chamber of Commerce, told a House public works subcommittee last week. They said further, that TVA's present operations should be put on a footing comparable to private utility operations to eliminate unfair competition.

Truce is reached by Cleveland Electric Illuminating with UWUA as EW goes to press. Ratification vote to end the 7-day strike is being taken. Agreement hinges on acceptance of re-worded contract which eliminates "necessary or desirable" phrase in defining company's decision on job changes. Pact also provides for a joint study committee to analyze job factors, 5% wage increase.

REA is sending out forms for its fourth annual survey of construction plans and loan needs of all electric distribution borrowers.

In a rebuttal brief filed with FPC, Pacific Northwest Power Co charges the commission's staff disregarded the fish problem in arguing that Nez Perce would be superior to the Mountain Sheep-Pleasant Valley hydro project on the Snake River. Company contends project would destroy about 20% of the Columbia River salmon resources. It argued further that the MS-PV project would provide all the flood control physically feasible in the reach of the Snake River and all that is needed on the Snake.

Ebasco Services appoints Harvey K. Breckenridge as manager of new San Francisco office. He is former West Penn Power VP.

First Boston Corp group wins $14 million Potomac Edison Co first mtg 4⅝% bonds (A) due 1987 with a bid of 100.965%; reoffers at 101.715% to yield 4.52%. As EW went to press, Alabama Power Co was getting ready to receive bids on $14.5 million first mtg bonds.

Congratulations . . . Niagara Mohawk Power Corp elects four new VP's: Storrs Bishop, Frank Osta, Arthur Evans, Floyd Wray. VP's R. H. Stratton and Frank McEvoy advance to new VP posts.

HEATING & COOLING ▶ **Commonwealth Ed pioneers with an electrically heated warehouse.** Using 16-v, off-peak power, the company heats expanded metal reinforcing grids buried in the 6-in. concrete floor. The concrete slabs store the heat during off-peak periods and maintain a fairly constant building temperature round-the-clock. To simulate the off-peak conditions of an industrial customer, all the grids in the warehouse operate during the night. Only those on perimeter operate in afternoon. It adds up to a 900-kw connected load, and there is another 115 kw available for snow-melting grids in the loading platforms outside the warehouse. If it works out, the scheme looks like a natural for many industrial and school applications (p 86).

Electric heat won out over gas for a small lumber supply firm at Painesville, Ohio. Installation saved money and space (p 127).

EVENTS ▶ **Credit men are tightening up collection practices,** requiring larger security deposits in an effort to pare down bad debt losses. Disconnects can be risky (p 76).

Ottis "Fitz" Fitzwater knows most of the 1,800 employees at Indianapolis P&L by their first names. He believes in electric heating and thinks there should be closer ties between schools and industry. You'll know "Fitz," the new president at Indianapolis P&L, better after reading profile (p 81).

WASHINGTON ▶ **REA doubled requests for loan authority** to meet co-ops' expansion program (p 78) . . . U. S. Chamber of Commerce clearly and warmly endorses industrial development of nuclear power (p 78).

GENERATION ▶ **Auxiliary power system design for a supercritical generating unit** must recognize the need for cutting steam losses to an absolute minimum because of the costly pure water required. It must also meet the need for extreme pressure rises across the boiler feed pumps. Cleveland Electric Illuminating provided for both these in design of the auxiliary system for its 250-Mw unit (No. 8) at its Avon Station. The design stresses high reliability and requires a 15.4-Mw electrical system for normal operation. The single half-size, motor-driven feed pump pulls 5.2 Mw. Counting in the turbine-driven boiler feed pumps, the total auxiliary power requirements run about 8.3% of the nameplate rating of the unit (p 96).

Homemade spindle carriage car handles a 42-ton rotor for maintenance at Metropolitan Ed's Titus Plant. It cost a mere $748.49 (p 103).

New recording instrument measures temperature of generator or motor field windings, is very versatile in applications (p 104).

SUBSTATIONS ▶ **Fast-growing load areas justify a hefty jump in substation size.** That's the conclusion of a study directed by J. K. Lawley, senior electrical engineer, Oklahoma G&E. In his service area Lawley believes that 75-Mva subs with 12.5-kv feeders would prove the

most economical over a 27-year period. The study was based on load growth anticipated by the company in a 24-sq mi area. A step-by-step study aimed at determining the optimum substation size pointed definitely to a 75-Mva size. The study envisions the unit expansion of substations with bus and site capacity sufficient for eventually reaching the 75-Mva range. Even though the ultimate size may not be reached in slower-growing areas, the study still indicates that it is a wiser and cheaper approach than is underestimating future substation requirements (p 92).

Economic advantages and dependability are on the side of forced oil cooling for larger power transformers. At 20,000 kva the economic advantage runs several thousand dollars. At 100,000 kva, somewhere around $50,000. These savings, backed by nearly 20 years of satisfactory operating experience, put forced oil cooling way out in front of other cooling systems (p 88).

DISTRIBUTION ▶ **Deluxe apartment building boasts 6,700-kw connected load** on lines of Potomac Electric Power Co. Outside vaults contain five 400-kva transformers. Three are networked on the 120/208-v side, and the other two supply 265/460-v for air conditioning. Picture story sketches in the details of the distribution system (p 90).

MANAGEMENT ▶ **Despite healthy state of residential power sales** there's still some trimming of estimates for the winter peak this year . . . Federal Reserve Board puts more starch in bank credit policy to slow inflation, but betting is that the tight money won't have much effect on capital expansion plans (p 163).

PEOPLE ▶ **Promotions:** Neil G. Simpson is new president and Duane Walrafen new operations vp at Black Hills P&L . . . Song-writing George F. Mackenzie is new vp at Pacific P&L . . . William E. Sprackling takes over the presidency at Anaconda Wire & Cable (p 172).

MANUFACTURERS ▶ **Sales and unfilled orders are generally up,** but net profits edged upward for only two of the five large electrical manufacturers whose first quarter earnings are reported (p 154) . . . First of the 18 gate hoists has been shipped for St. Lawrence project . . . Delta Star Electric division of H. K. Porter goes into the distribution transformer business . . . Westinghouse stops making induction regulators (p 156).

NEW EQUIPMENT ▶ **Now on the market:** Heavy duty, 4-bolt one-piece aluminum connector handles conductor up to 397.5 MCM. It's easy to install . . . New shuntless, tilting insulator switch boasts pressure loaded, annular silver-to-copper bearing surfaces at all hinge points replacing the flexible braid connector. It is available in ratings of 7.5 and 34.5 kv at 200 to 600 amp . . . New line of single-phase, 16-step regulators in ratings through 167 kva is said to permit traverse from full buck to full boost in less than 13 seconds (p 132).

ENGINEERING TRENDS

Computers will find more extensive application as adoption of transistors on printed circuits in place of conventional vacuum tubes and manual wiring cuts the office space required for installations. And eventually ferro-magnetic films are expected to cut their computing time to millimicroseconds.

Controlled high-current glow discharges can apply upwards of 50 kw of electric heat to harden the surfaces of complicated steel parts by diffusing hydrogen into it. Swiss scientists claim the new process causes so little distortion that precision parts can be ground to final tolerances before hardening.

Efficiency gains of 1 to 3% in steam plant operation are predicted from improvements in last-stage steam flow conditions and from installing cooling towers to overcome vacuum losses caused by summer-heated cooling water.

Placing fuel elements in individual cylindrical pressure enclosures instead of using one huge pressure vessel to contain the entire core may offer the possibility of very high unit capacity natural uranium reactors.

Salinity of tidal rivers used to cool steam plant condensers is readily monitored by conductivity cells of two platinized, gold-plated nickel electrodes immersed in the cooling water.

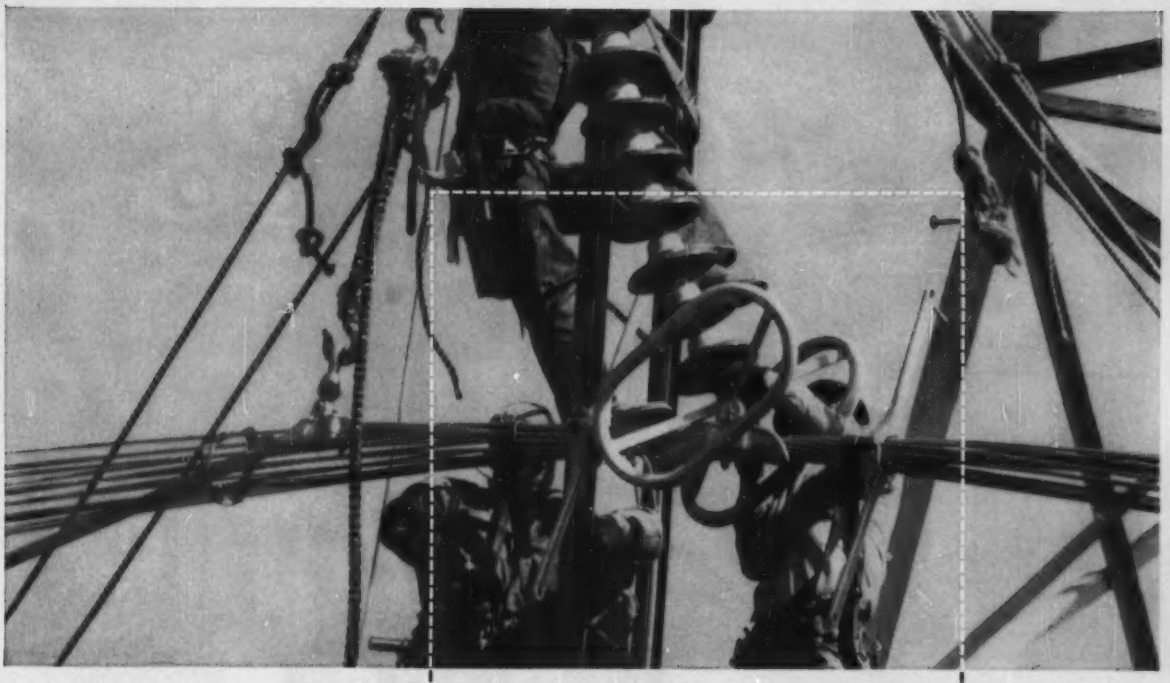
Power cost from nuclear and conventional plants will be about the same by 1960 in Great Britain, according to the British Atomic Energy Authority. But by 1990 cost of nuclear power will have decreased 50% while that of conventional power will have increased 40%.

Nuclear fuel fabrication costs cannot be predicted accurately as yet. A recent parametric study by Babcock & Wilcox Co for a 250-Mw pressurized water reactor shows that fabrication expenses for a 6½-ft core with stainless-steel-cladded fuel elements will vary from a high of $0.17 per million Btu to a low of $0.02 per million Btu. Irradiation levels for the fuel ranged from 5,000 to 15,000 Mw-days per ton. And the unit cost of heat transfer surface ranged from $50 to $200 per sq ft.

FROM EDITORS IN THE FIELD

Distribution systems for future residential loads will use a transformer at each house, powered by an underground single-phase primary cable, predicts H. G. Hally of Iowa P&L Co. Capacity increases would be met economically by substituting larger core-and-coil assemblies in the built-in transformer tank.

Pole-type transformers cut transformer costs 20% for vaults where units will not be submerged. When connecting pole-type transformers to a secondary network, Florida Power Corp mounts the network protector on a steel frame.



When they're *designed together*

they'll perform together!

That's How You Benefit When Both Insulators and Hardware Come From One Manufacturer

Control rings, suspension clamp, and suspension insulators in this installation all come from a single manufacturer.

Why is this important? Consider the control rings on this extra-high voltage line, for example. Should they be designed to control corona on the suspension clamp, or on the suspension insulators?

Rightly designed, they control corona in both areas, if that is a requirement specified by the builder of the line. That means that a designer must have an appreciation for the corona characteristics of both insulators and hardware.

Integration of hardware and insulator performance can obviously be achieved much more readily when they are designed and built by the same people, as they are at Ohio Brass. Then you can be assured that they will perform correctly when installed on your lines.

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Ohio Brass

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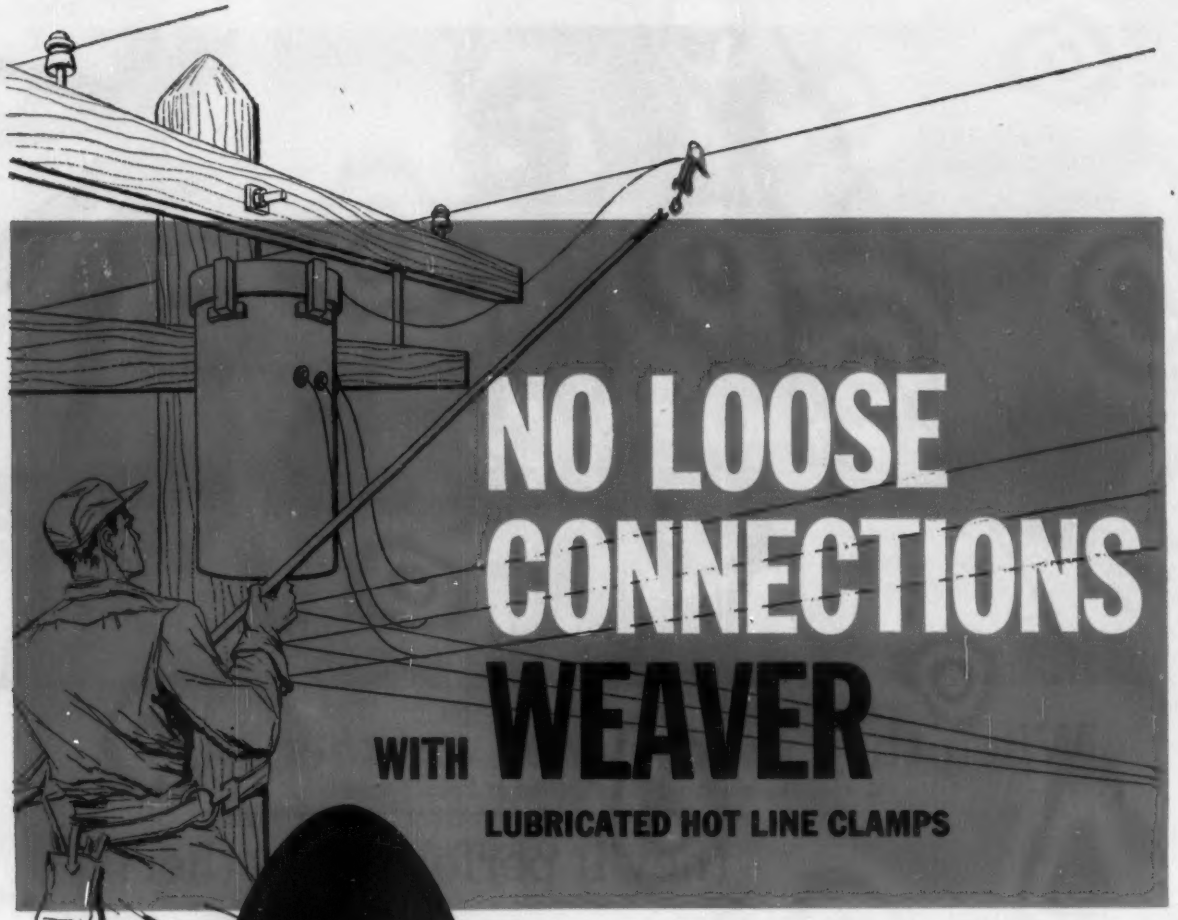

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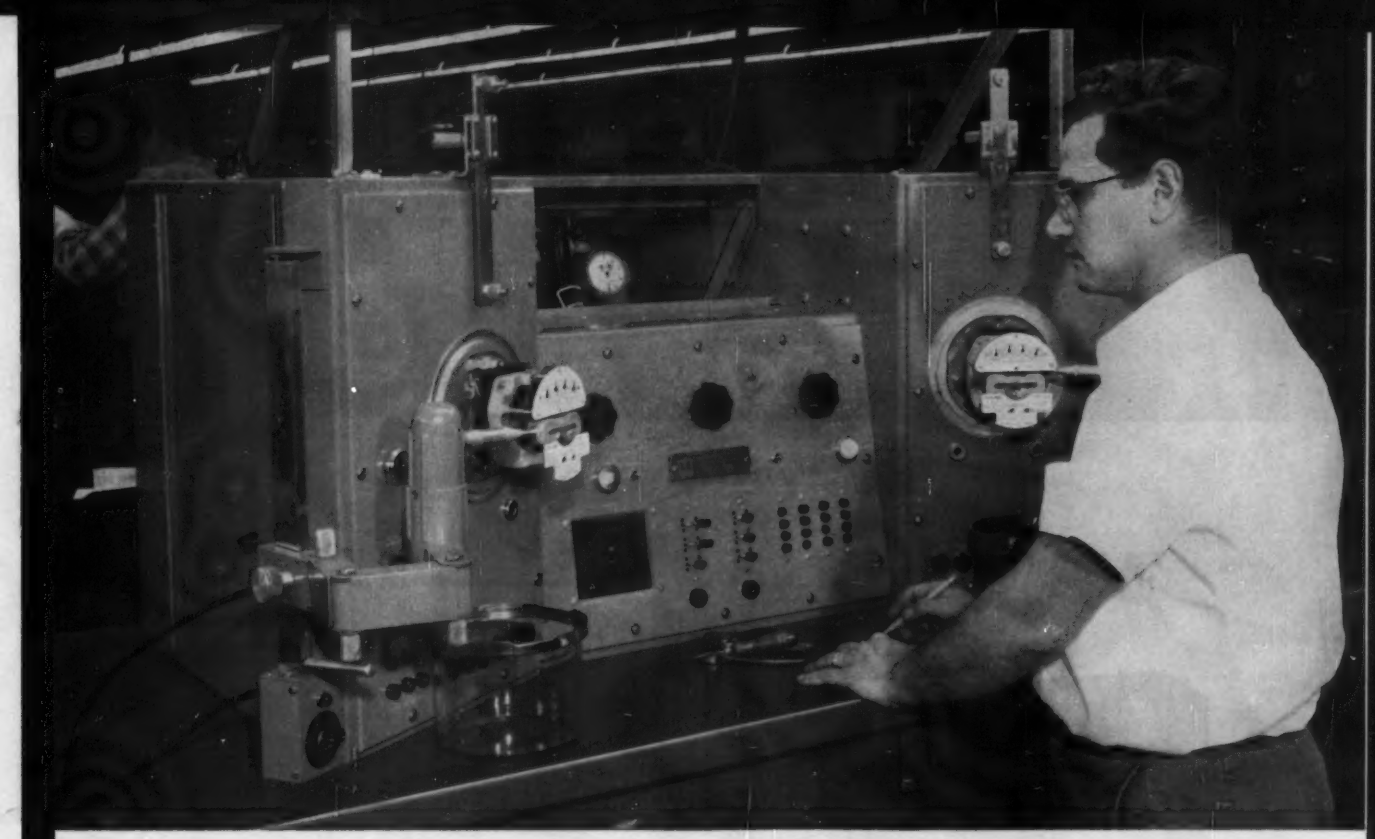


LOOK TO YOUR OWN RECORDS

for unbiased proof of watthour meter performance

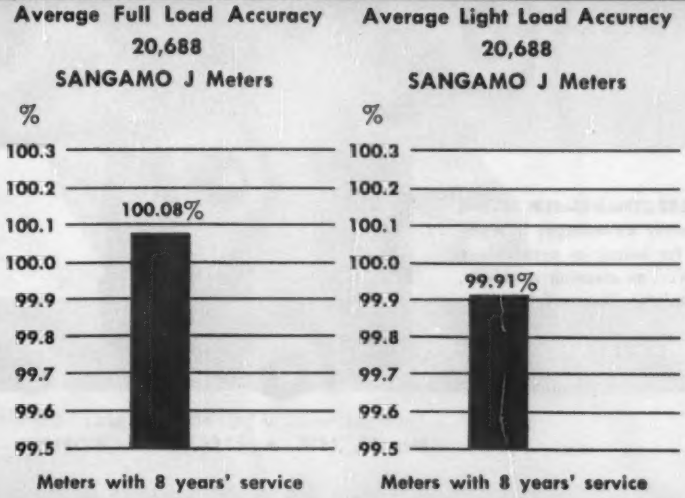
Want to know the facts about the watthour meters on your company's lines? How they stand up in service? How accurately they retain their calibration —what it costs to keep your meters on the line? Then, look to the test records and accuracy reports of your own Meter Department—kept for your information as a company executive.

We think that you will be surprised—and pleased with the performance of the Sangamo Meters on your lines.

Shown below are meter accuracy records from one large operating utility that show the average full load accuracy and the average light load accuracy of more than 20,000 Sangamo J Meters after 8 years of service.

Such sustained accuracy is characteristic of Sangamo Watthour Meters. And such sustained accuracy is the reason why the J2 is your best investment in a watthour meter.

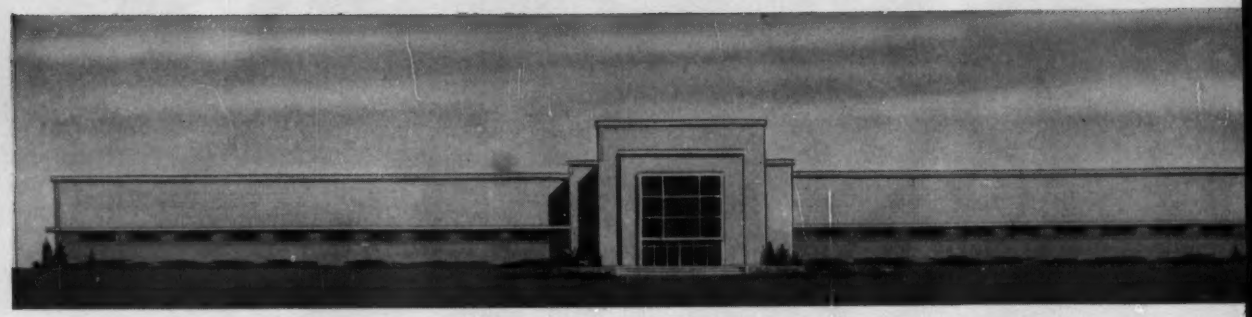
Actual performance records of 20,688 J Meters after 8 years service



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

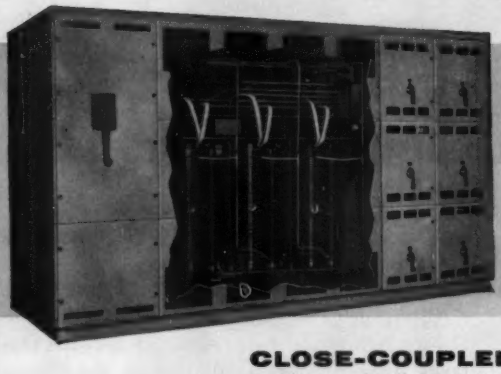
JM57-3



Can your in-plant distribution

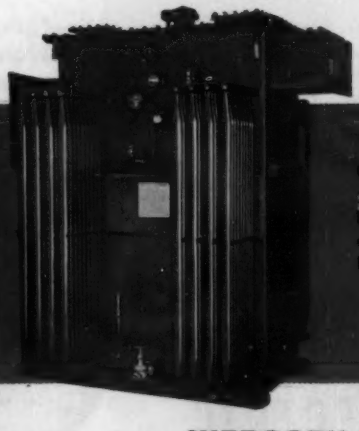
WAGNER UNIT SUBSTATION

continuous dependable



DRY TYPE (OPEN, VENTILATED)—For indoor use only. Normally installed in a dry, dust-free atmosphere in a well-ventilated location. Light in weight... ideal for multi-storied buildings... no fireproof vaults necessary.

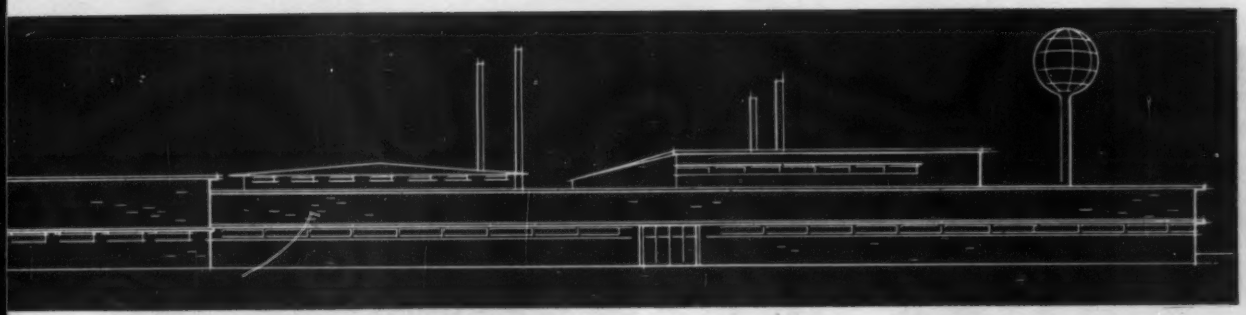
CLOSE-COUPLED. These liquid-filled transformers fit flush against switchgear enclosures, eliminating throats and saving space... available in ratings from 500 through 2000 kva. Connections are made at the bushings on the sides of the transformer.



OIL AND NOFLAMOL-FILLED. Oil-filled transformers are generally used outdoors. They can be used indoors if fireproof vaults are provided. Noflamol type in this model is filled with a non-inflammable liquid making it especially suitable for chemical plants, refineries and other locations where explosive liquids and gases are present.

NITROGEN-FILLED. These Class H Silicone Insulated Transformers offer many advantages in maintenance and safety. Suitable for indoor or outdoor use ... covers are welded to tank... no cleaning problems, even in dust-filled areas... completely fireproof. In ratings up to 2000 kva.

LIVE BETTER ELECTRICALLY



system meet tomorrow's needs?

TRANSFORMERS will assure power for years to come

Nothing is more important to your plant than an uninterrupted flow of power. You can't afford to be handicapped by a system that is unable to meet expanding demands. Your in-plant distribution system must be planned with an eye to the future—with plenty of capacity and flexibility for growth.

It will pay you to check over your distribution system—find out how adequately your transformers meet present and *future* load requirements.

And it will pay you to specify Wagner PREDESIGNED Transformers for your load-centers. You will save time—save job engineering costs—and get liberally designed transformers with the switchgear of your choice. Wagner PREDESIGNED Transformers are engineered to meet heavy industrial demands. They are built in standard ratings which are coordinated with the specifications of unit substation builders.

Bulletins TU-205 and TU-214 give full information on Wagner Unit Substation Transformers for industrial power needs. Write for your file copies today.

WAGNER DRY-TYPE TRANSFORMERS
put the right voltage close to the load

Save money through shorter runs of copper, reduced line losses, and lower installation expenses. These Wagner Dry-Type Transformers are compact, light in weight and safe to use. No fireproof vaults or other enclosures necessary... install inside or out. The 150° rise transformer is standard in ratings 3 through 10 kva and is also available through 50 kva. 55° rise model is standard in 1, 1½ and 2 kva, and the 80° rise transformer is standard in ratings 15 through 100 kva. Write for Bulletin TU-57 for full details.

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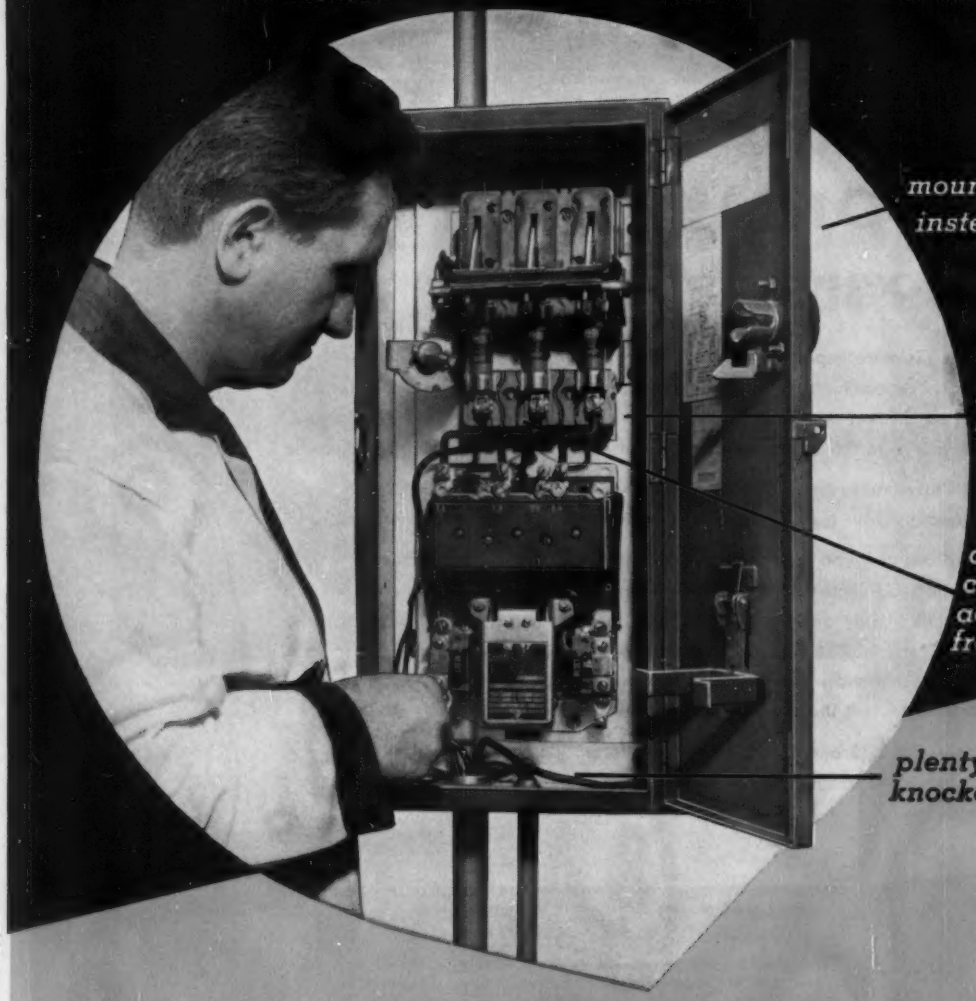

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(Switch or Circuit Breaker Types)

Save space and time. Mount and wire one device instead of two... neater, more attractive installations.

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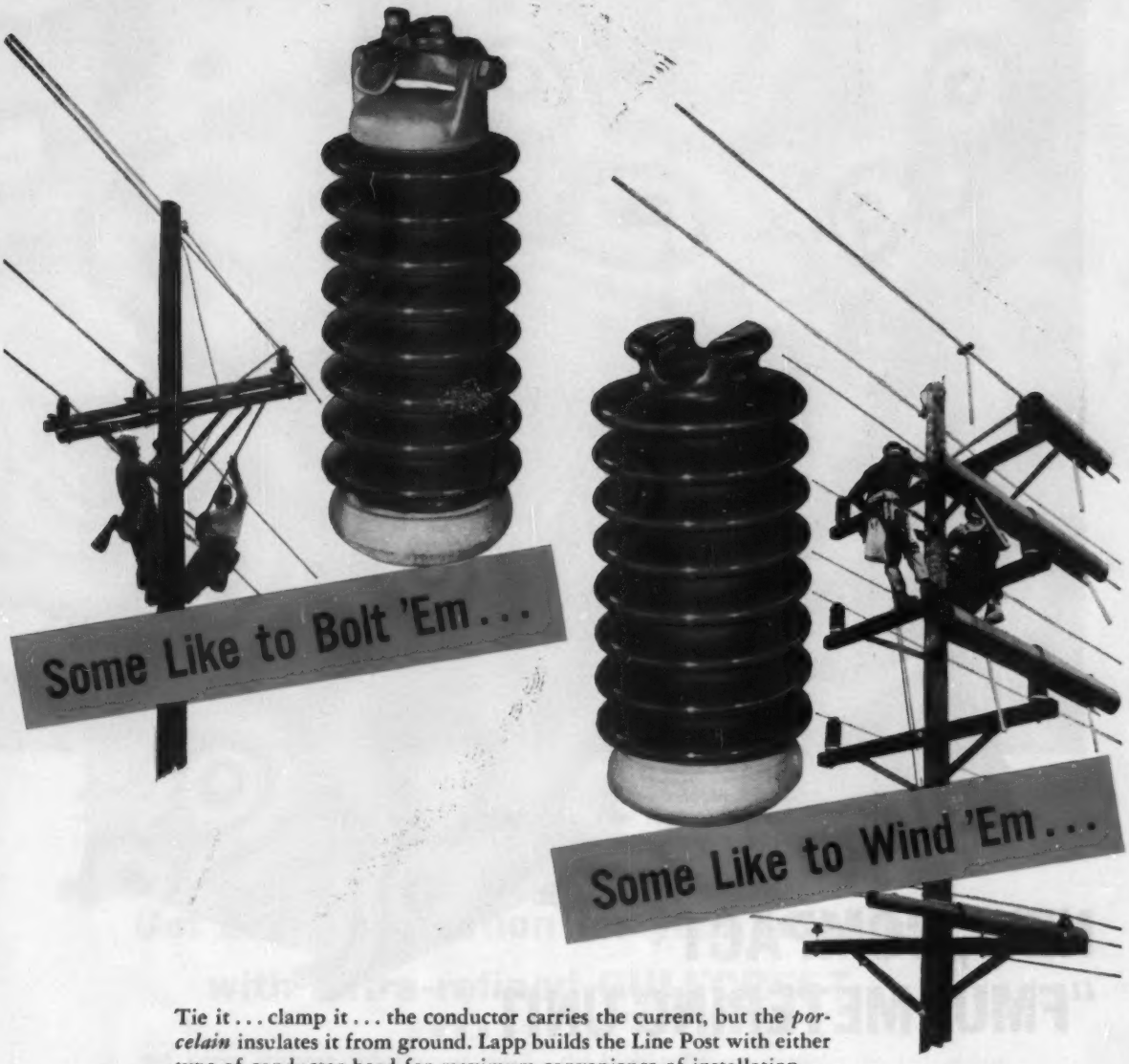
Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY



Tie it . . . clamp it . . . the conductor carries the current, but the *porcelain* insulates it from ground. Lapp builds the Line Post with either type of conductor head for maximum convenience of installation . . . and it builds the *porcelain* to do the *insulating* job. The porcelain in either case is a closed-end post, of high density vacuum-process electrical porcelain. It won't puncture because it has no conductive material within it. It outperforms any other type of insulator in dirt conditions because its fog-type design prevents leakage flashover from non-uniform leakage resistance. It stands up under arcover, stones and bullets because its short, sturdy petticoats protect the body. And it won't crack because its hardware, both top and bottom, is *externally* attached, and can load porcelain only in compression.

With tie-wire or clamp-top, the Lapp Line Post will give you an *extra* margin of operating security, low upkeep, long life.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

NEW, COMPACT "FMU" METERING UNIT...

up to 42% smaller, 62% lighter

The new line of all-weather outdoor metering units —Westinghouse Type "FMU"—with up to 35% less base area maintains the high accuracy and dependability of its predecessor, the Type "MP". Utilizing compact Form-Fit® design, the completely sealed "FMU" outfit reduces oil content—as much as 56%. Installation is simplified and speeded by weight reduction—up to 62% in the highest rating.

The new "FMU" metering unit, combining both current and potential transformers in one case, when compared with separate components, provides a smaller, neater package, with fewer connections and less installation time. Current ratios can be changed externally, by means of a series-parallel switch for each current element . . . an indicator, easily read from a distance, shows the type of connection.

Available for single- and three-phase service, with primary current ratings 10/20 through 400/800 amperes in 25-, 34.5-, 46- and 69-kv ratings.

For the complete story, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

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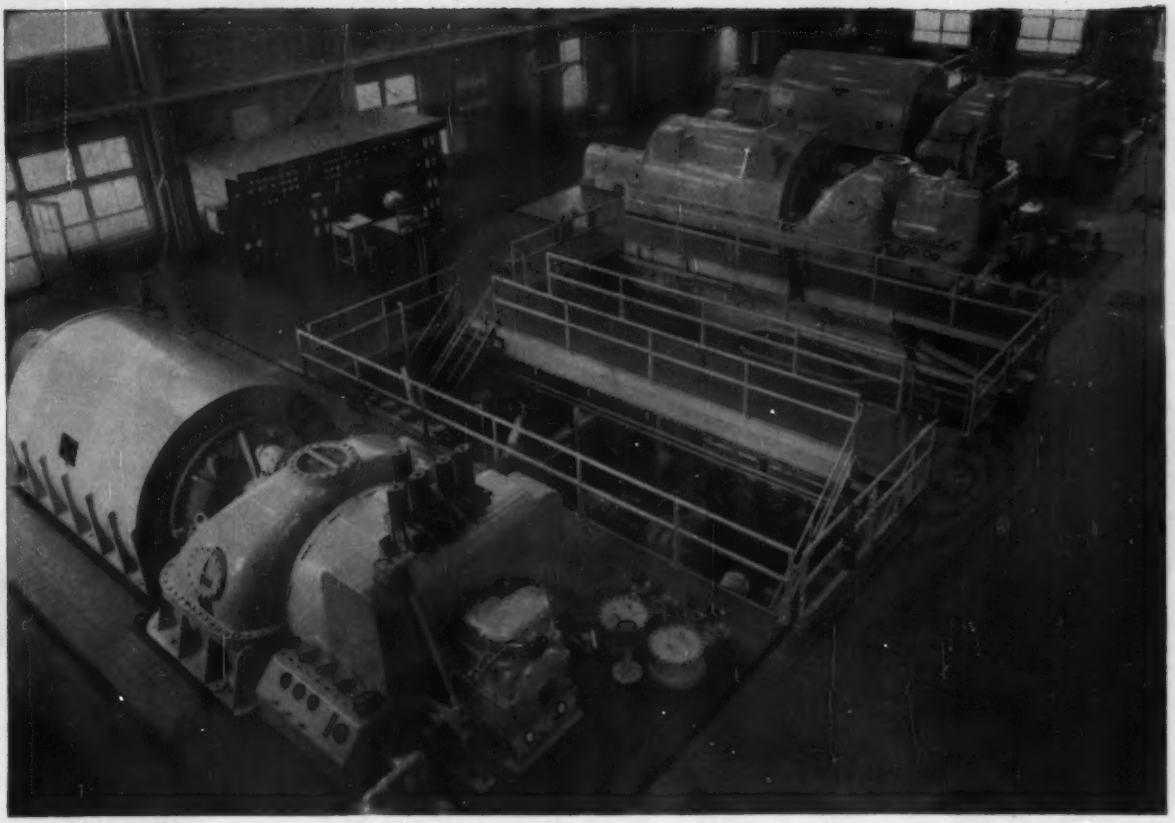

Gulf Power Company's Crist Steam Plant at Pensacola, Florida, operates two 22,500 kw General Electric turbines, and one 30,000 kw Westinghouse. Gulfcrest went into their No. 1 turbine in 1945, their No. 2 unit in 1949, and No. 3 in 1952 . . . and has given outstanding performance from the start.

Get extra protection for your turbines with extra-refined GULFCREST

Gulfcrest keeps turbine lubricating systems extra clean—free from rust, sludge or foam. Power companies know they can get best results with Gulfcrest because it is the only turbine oil that is super-refined by the Alchlor Process. This is an extra step in refining that removes sludge-forming hydrocarbons. After the finest crude oils become a highly refined turbine oil, the Alchlor Process actually discards about 15% *more* of it—to achieve the unmatched quality of Gulfcrest.

Gulfcrest has been used continuously in some turbines for 20 years—with no significant change in its neutralization number. Your Gulf Sales Engineer will recommend the proper grade of Gulfcrest for you. He's at your nearest Gulf office.

GULF

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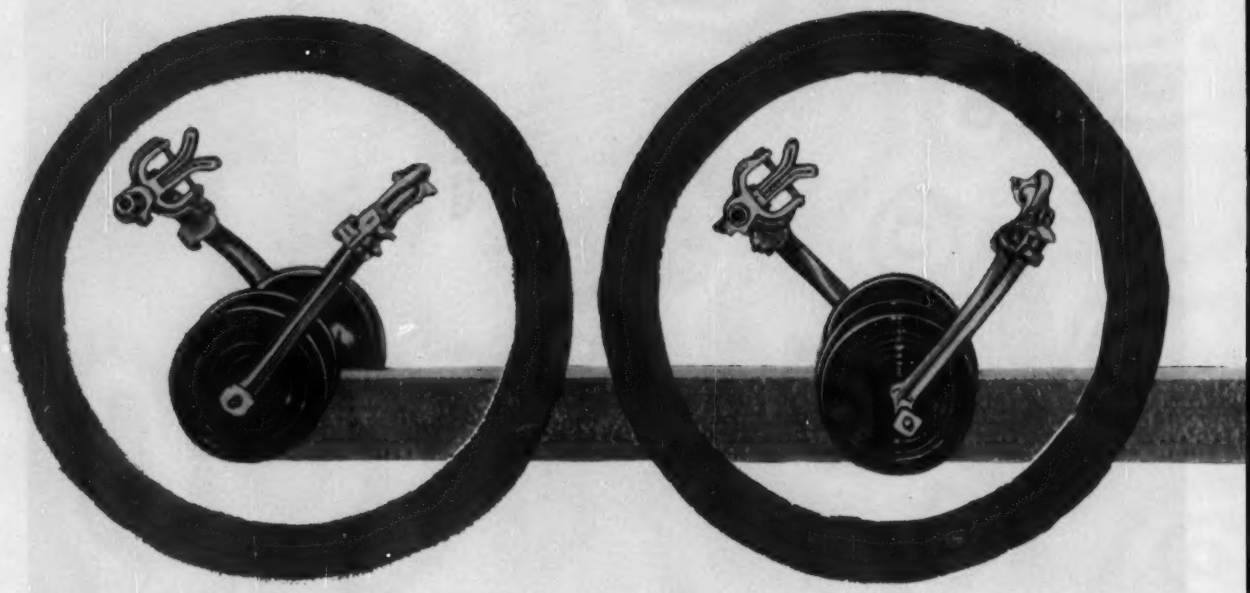
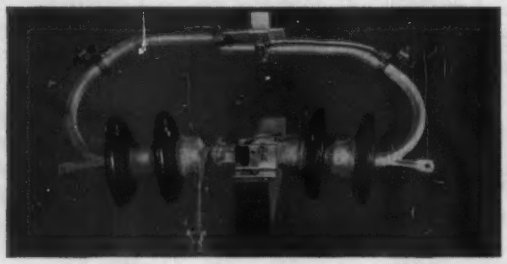
The Finest Petroleum Products For All Your Needs

This "look" on a pole



The original "straight-through" airbreak switch—proven in 50 years of system service

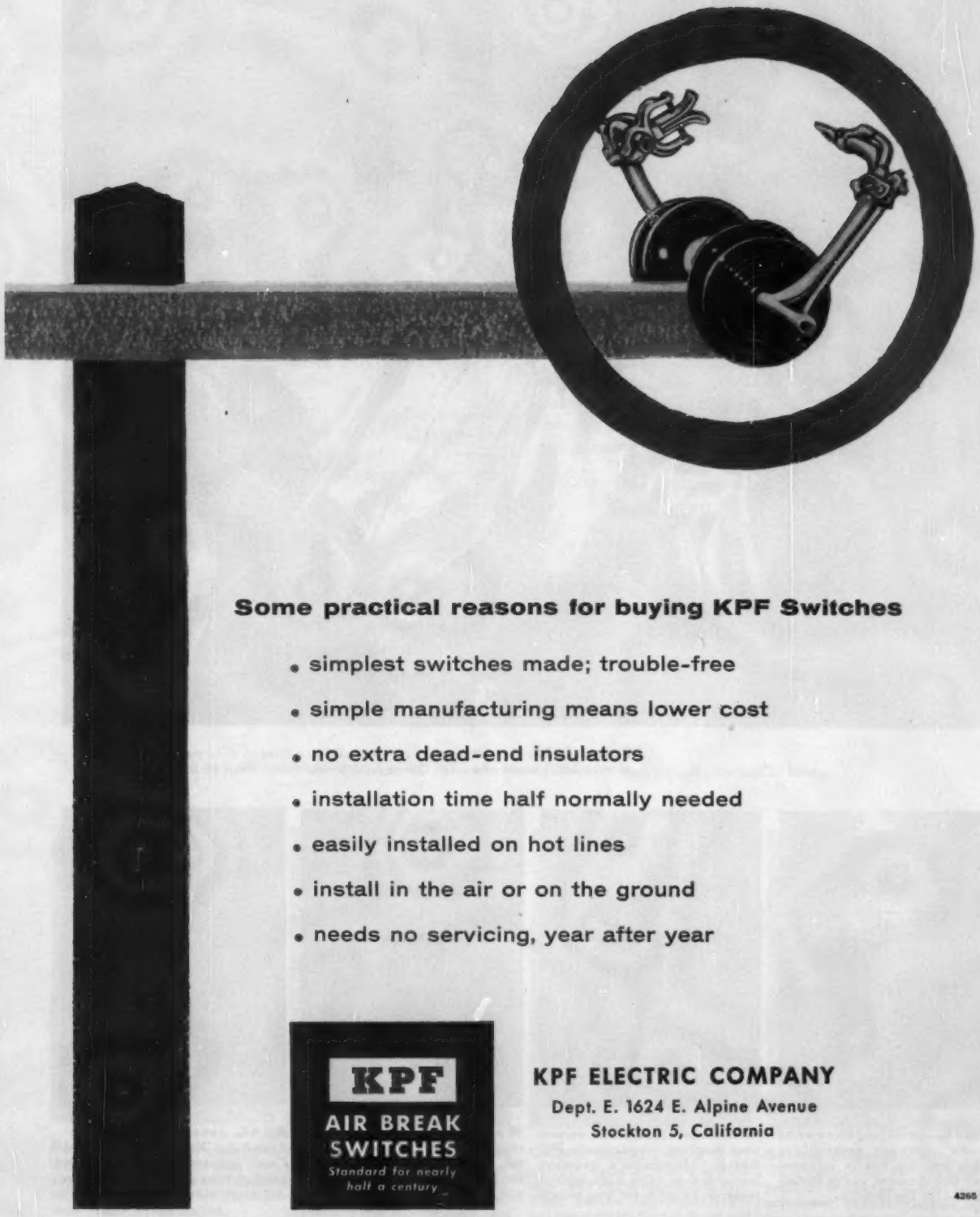


There's no mistaking the exclusive, clean, functional appearance of KPF switches. Their pleasing appearance derives from their simple design—simple design that assures you operating ease in all weather. There are no complicated mechanisms to malfunction, freeze, lock, need lubrication or wear out.

For 50 years, KPF switches have proved their trouble-free service advantages to major power companies. Why not make a test installation on your own lines; see for yourself. More and more companies are. Why not do it this month?

Write direct for catalog.

means KPF



Some practical reasons for buying KPF Switches

- simplest switches made; trouble-free
- simple manufacturing means lower cost
- no extra dead-end insulators
- installation time half normally needed
- easily installed on hot lines
- install in the air or on the ground
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AIR BREAK
SWITCHES
Standard for nearly half a century

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Power Cable that eliminated 26 competitive cables in time periods of from zero to 2,509 hours of a High Ozone Attack test—then went on to 6,000 hours.

Tripiex—combining three wires in one compact assembly—makes possible neater services, fewer attachments, easier installations—for big savings.

ACSR that can meet or exceed your toughest requirements. Put Kaiser Aluminum's growing leadership in extra high-voltage research to work for you today!

Weatherproof—One of the nation's leaders in covered conductor, Kaiser Aluminum supplies the finest distribution, secondary and service cable in the field.

AAAC, developed and introduced by Kaiser Aluminum! Gives greater strength in high conductivity and is stronger than All Aluminum Conductor.

IF IT CARRIES CURRENT

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Now! Unsurpassed benefits for electric utilities due to Kaiser Aluminum's recent purchase of the Wire and Cable Division of U. S. Rubber, located at Bristol, Rhode Island!

Now from one source, you get all the established KW products plus all products of the new Bristol mill (formerly Wire and Cable Division of U.S. Rubber). For former U.S. Rubber products, the same quality insulations and product guarantee terms will be continued.

Now from one source, you get the most advanced technical assistance in the industry—the full cooperation of the research and development leaders of both aluminum and copper conductors.

Now from one source, better-than-ever service—from two plant locations (Newark, Ohio and Bristol, Rhode Island). This includes service from the production, engineering, sales and distributor organizations of both Kaiser Wire and the former Wire and Cable Division of U.S. Rubber.

For immediate attention to any request for electrical conductor products, engineering and research service, or further information, contact your nearest Kaiser Aluminum sales office or the KW distributor listed in your telephone directory.

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Control Cable, backed by 67 years of experience in electrical wire and cable manufacturing. That means dependability—*proved security* for public safety!

Service Entrance Cable, now UL-approved for 75° wet applications! Improved design characteristics include pleasing appearance and ease of application.

Electronic Route to Lower

M. W. Kellogg's Digital Computer Permits More, Faster, Accurate Flexibility Analysis of Complex Main and Reheat Piping Systems

Control section of Kellogg's electronic computer.

KEEPING PACE with the increasingly critical pressures and temperatures of the modern steam-electric power plant are M. W. Kellogg's advanced techniques for pre-determining stresses and reactions of main and reheat piping. Most recent addition is a large magnetic drum digital computer, used to calculate forces, moments, deflections, rotations, and stresses in complex piping systems.

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A pioneer in flexibility analysis techniques, which include manual calculations, model testing, and a smaller electronic computer, Kellogg continues its pioneering in the power piping industry by the addition of this high speed computer to its New York engineering facilities.

A cordial invitation to see the M. W. Kellogg electronic computer at work is extended to consulting engineers and to engineers of power generating companies and their equipment manufacturers. Appointments may be made through the Sales Manager, Fabricated Products Division.

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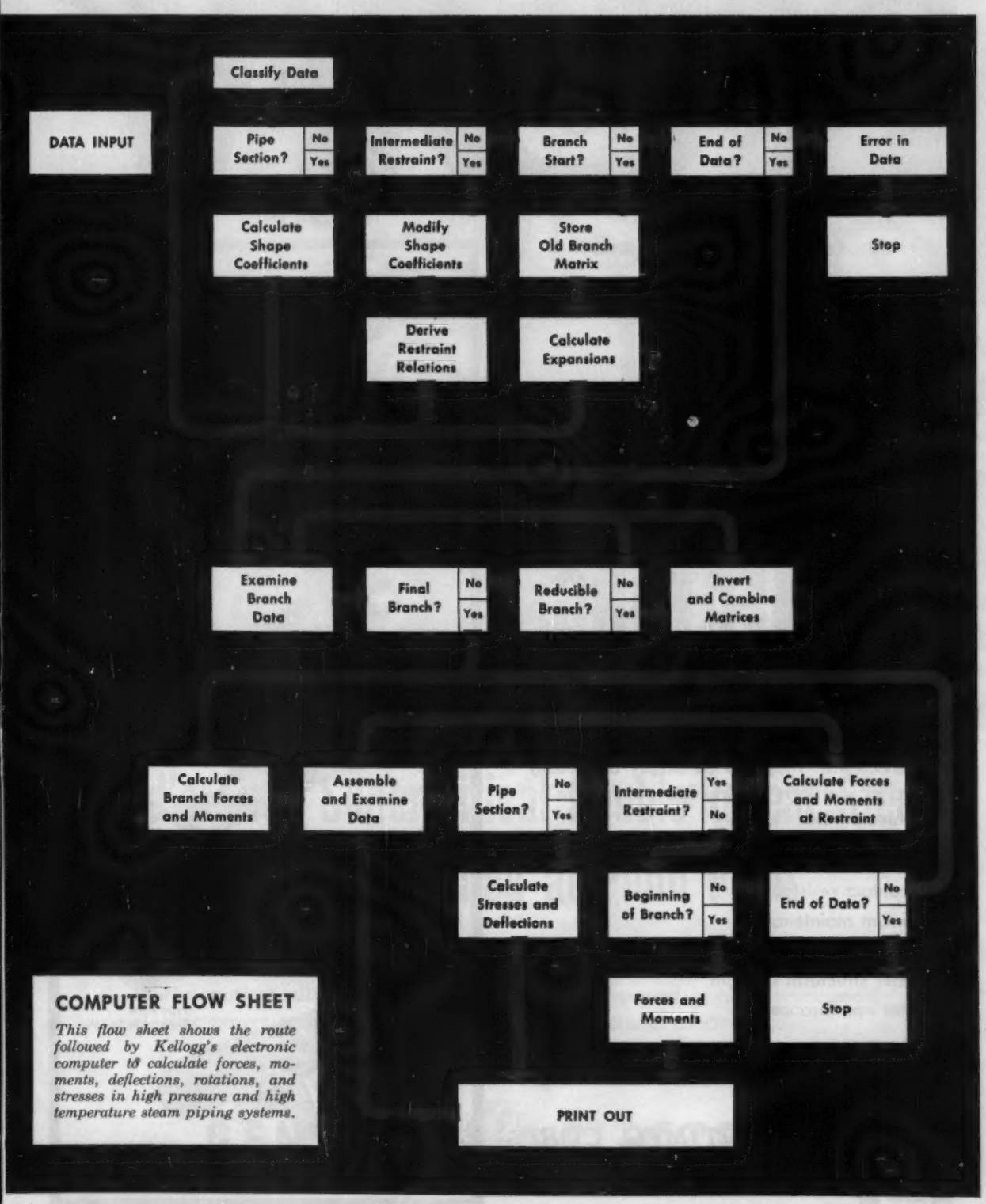
POWER PIPING—THE VITAL LINK

Steam Power Piping Costs



COMPUTER FLOW SHEET

This flow sheet shows the route followed by Kellogg's electronic computer to calculate forces, moments, deflections, rotations, and stresses in high pressure and high temperature steam piping systems.

NOW

connections that will last forever with

DOSSERT WELDING ALUMINUM CONNECTORS

the most diversified line for substations and generating plants

DOSSERT connectors offer economy as well as long service life. They can be simply and easily installed by inert-gas arc welding, resulting in an all-aluminum weld.

These aluminum connectors feature:

- no contact resistance
- minimum maintenance
- higher corrosion resistance
- greater structural strength
- neater appearance

We also welcome inquiries on modifications or applications.

50 YEARS OF TECHNICAL ACHIEVEMENT

DOSSERT MFG. CORP.

255 Huron Street, Brooklyn 22, N. Y.

Representatives in all principal cities

IN CANADA: W. S. Gerrie & Assoc., Ltd., Toronto

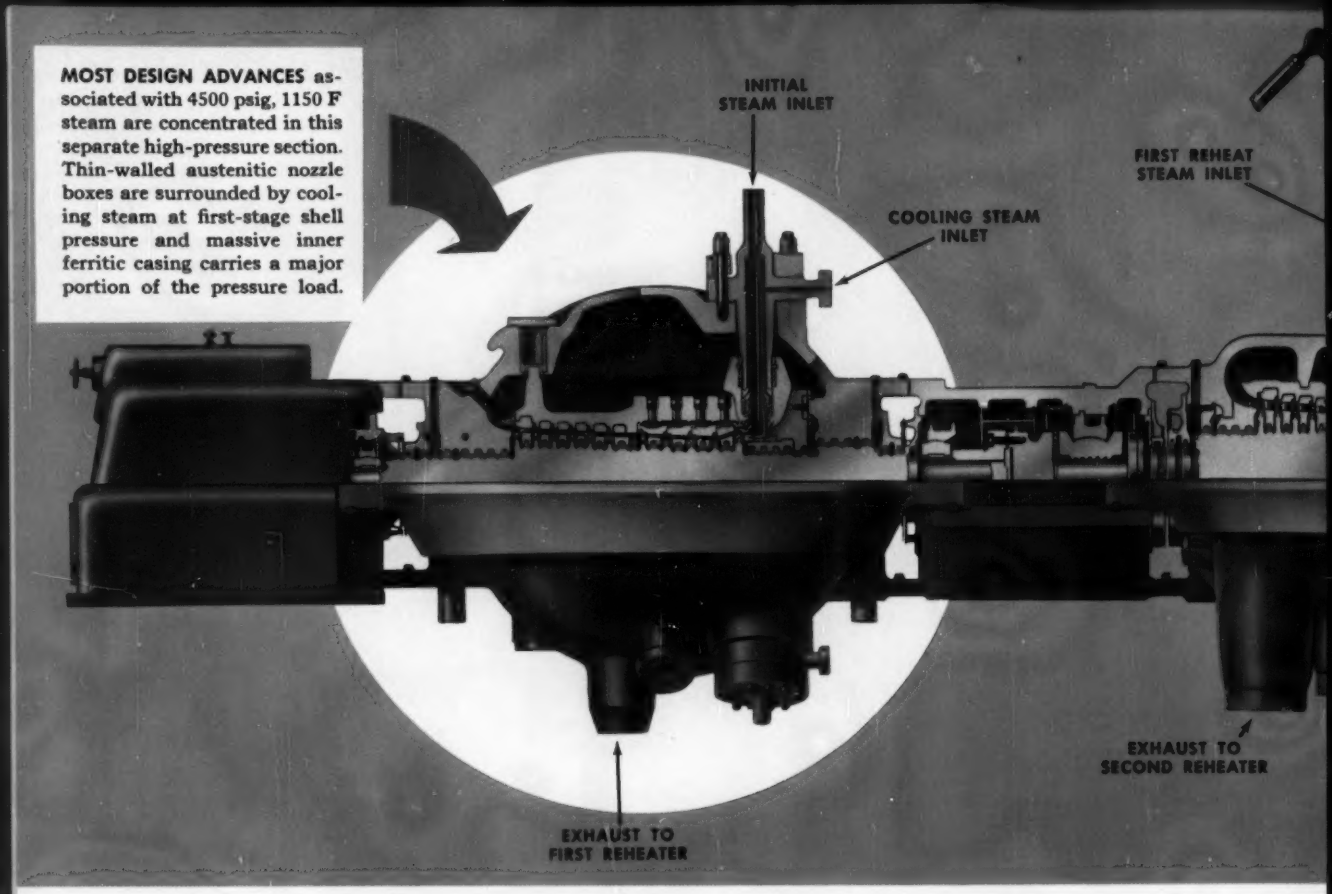
World's First Supercritical Double-Reheat Steam Turbine Installed at Philo Plant

New 125,000-kw General Electric unit at Philo Plant of Ohio Power Company marks another milestone of progress in the development of more economical electric power production through higher initial steam conditions.

Progress Is Our Most Important Product

GENERAL ELECTRIC

FOR DETAILS, TURN TO NEXT THREE PAGES



MOST DESIGN ADVANCES associated with 4500 psig, 1150 F steam are concentrated in this separate high-pressure section. Thin-walled austenitic nozzle boxes are surrounded by cooling steam at first-stage shell pressure and massive inner ferritic casing carries a major portion of the pressure load.

Higher pressures and temperatures operate through double-reheat cycle to raise fuel economy

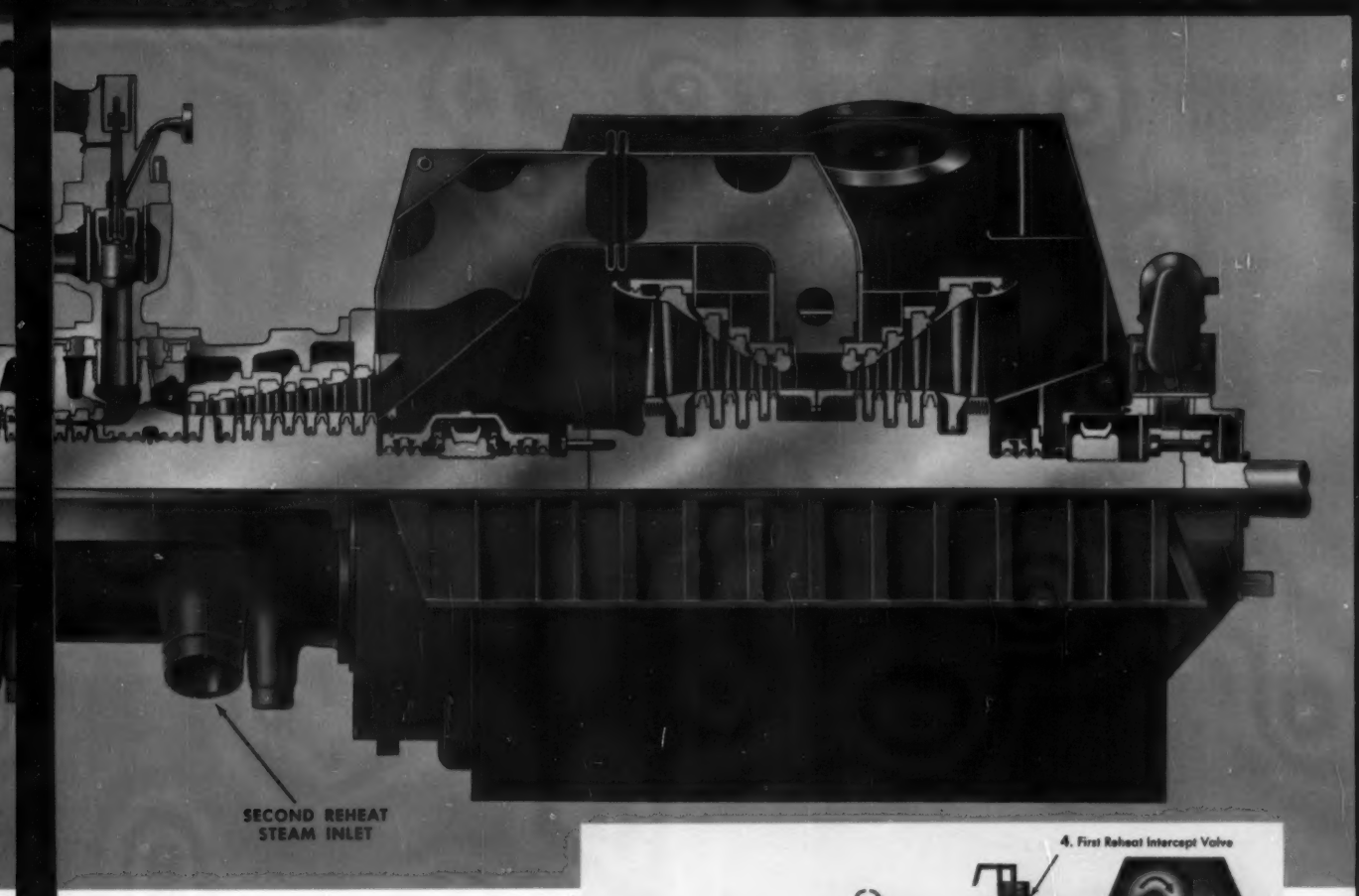
New unit will run at 4500 psig, 1150 F initial temperature, with 1050 F first reheat and 1000 F second reheat

The Ohio Power Company's Philo Plant, one of the key generating units of the American Gas & Electric Company's system, has become the site of another significant advance in electric power generation. It will be the first station to generate commercial electric power from a turbine-generator operating at the supercritical pressure of 4500 psig—almost double the highest pressure used to date. Its initial steam temperature of 1150 F is 50° greater than the previous high of 1100 F reached only three years ago.

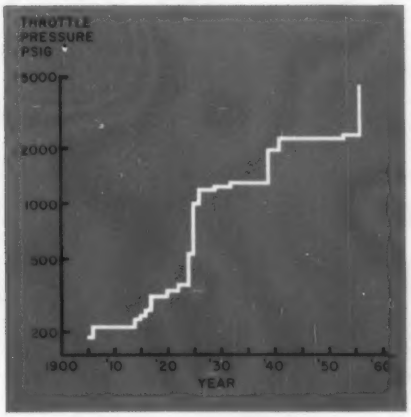
These advanced steam conditions, coupled with the first application of the double reheat cycle, can increase thermal efficiency 5% over the most efficient steam plant now in operation.

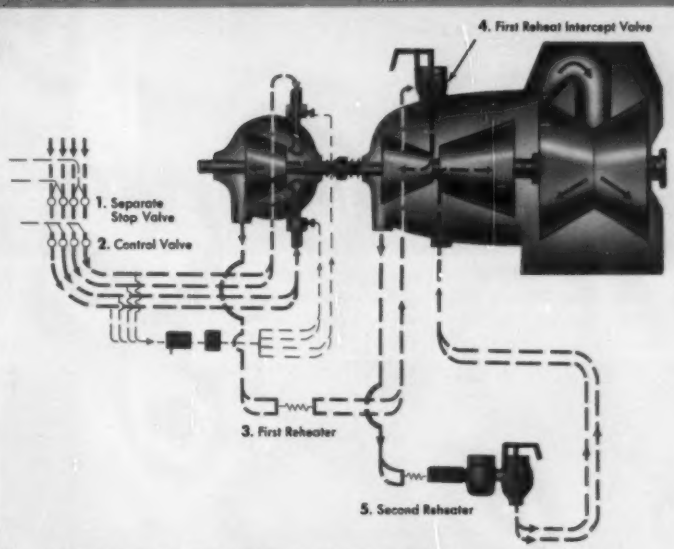
ONE OF THE MAJOR PROBLEMS General Electric designers had to overcome was the danger of thermal distortion of thick austenitic castings and forgings. So austenitic steel parts were made as thin as possible by use of 1) a steam cooling arrangement which permits the use of thin-walled austenitic sections with low temperature gradients and reduced susceptibility to distortion, 2) individual control valve bodies of small diameter and consequently thinner walls, 3) multiple steam pipes with individual turbine stop valves placed in each line, and 4) simple throttling control with full 360-degree arc admission to the first stage nozzles.

THE EXPERIENCE GAINED and new ideas developed during the design and manufacture of this first supercritical-pressure steam turbine are already being applied to the study of larger units for even more economical operation. The Philo turbine may well mark a turning point in the history of steam power generation. For more details, write for Bulletin GER-1130, Large Steam Turbine-Generator Department, General Electric Co., Schenectady 5, New York.



Progress in increasing throttle steam pressure over the past 50 years. The new advance to 4500 psig represents the first major step upwards since a maximum of 2300 psig was achieved in the early 1940's.

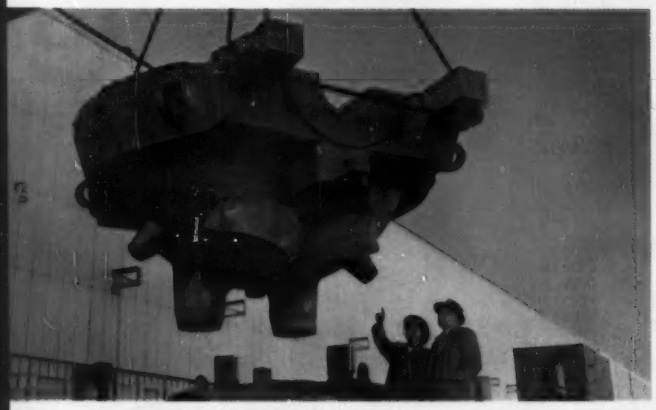




SUPERCRITICAL STEAM ENTERS THE TURBINE through four main steam pipes. Each pipe has a separate stop valve (**1**) and control valve (**2**) located below the turbine room floor. Steam exhausts at 800 F to first reheater (**3**). Here it is reheated to 1050 F and enters center of intermediate turbine through first intercept reheat valve (**4**). Then it expands through nine stages toward middle standard and exhausts to second reheater (**5**) at approximately 207 psig, 600 F. Steam leaves reheater at 1000 F to re-enter remaining portion of intermediate section, passes through crossover, and expands to condenser through double-flow, low pressure turbine.

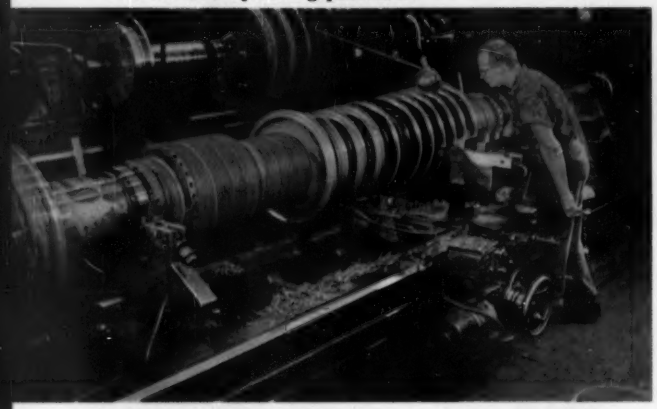
GENERAL ELECTRIC

Building a 4500 psig supercritical steam turbine...



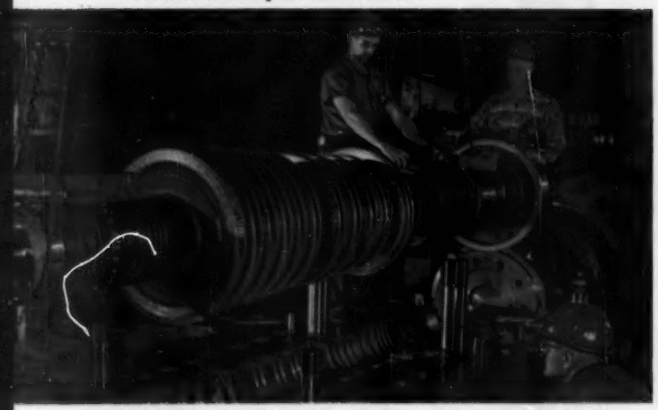
1 **CASTING COMES IN:** Lower half of massive cast ferritic outer casing for high-pressure section is delivered. Spherical shape helps minimize stress and enables casing to withstand operating pressures.

2 **MACHINING OF CASTING** is done with extreme accuracy. Prior to machining, casting was thoroughly checked for internal flaws by 15-million-volt betatron, which can "see" through more than a foot of steel.



3 **ROTOR IS MACHINED** from a solid forging of Type 347 steel, then heat treated to remove stresses. An alternate steam-cooled ferritic rotor is also being supplied for further developmental studies.

4 **ROTOR IS INSPECTED** after final assembly. First stage buckets are only about $\frac{3}{8}$ in. long, with multiple-hook dovetails designed to take care of differences in thermal expansion between rotor and buckets.



5 **TURBINE IS ASSEMBLED** as high-pressure rotor is lowered into lower half of shell. High temperatures and pressures necessitated several unique innovations in design of diaphragms and other parts.

6 **FINAL ASSEMBLY** is culmination of months of designing, manufacture and exhaustive testing of individual components. Operating at 4500 psig, this unit will help evaluate the use of supercritical steam. 254-31

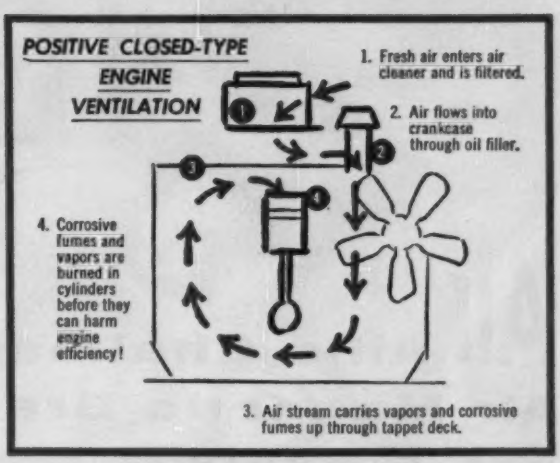
Leader in Turbine-Generator Progress

GENERAL ELECTRIC

"CLEAN LIVING" GIVES A CHEVY ENGINE LONGER LIFE!

. . . more evidence that Chevrolet Task-Force trucks are engineered better and built better for bigger savings!

This drawing shows, roughly, one of the ways in which Chevrolet truck engines minimize a major cause of wear—dirt! Now consider this additional evidence that Chevy heavy-duty V8's and 6's "live clean" and bring you fleet, dependable power that costs less to use!


POSITIVE CLOSED-TYPE
ENGINE
VENTILATION
1. Fresh air enters air cleaner and is filtered.
2. Air flows into crankcase through oil filler.
3. Air stream carries vapors and corrosive fumes up through tappet deck.
4. Corrosive fumes and vapors are burned in cylinders before they can harm engine efficiency!

Extra filters give extra-clean fuel—Only *clean* fuel reaches the engine—that's one reason you can depend on a Chevrolet truck! All fuel is filtered twice (once in the fuel tank and again in the carburetor) to keep dirt and water from hampering efficient operation. Chevrolet truck V8's provide a *third* filter, at the carburetor, for triple protection!

Oil stays clean longer, too—Chevrolet truck V8's and 261-cu.-in. 6's come equipped with modern high-capacity oil filters (V8 filters are of the Full-Flow type). These engines keep *clean* oil flowing to moving parts; parts wear less and last longer because of it!

Even the air is cleaner—Dust and foreign matter in the air an engine "breathes" can reduce engine life by years. Chevrolet minimizes this wear-producing factor by providing big oil-bath air cleaners as *standard equipment* on all truck engines.

These are sound under-the-hood reasons why a Chevrolet truck will *stay* on your job and *save* on your job. There are others, too, including short-stroke V8 design (shortest stroke of any truck V8's!) and 6-cylinder engine design that puts out more power than any other in the field. You'll learn about them all when you visit your Chevrolet dealer. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Biggest sellers . . . because they're biggest savers!

CHEVROLET TASK·FORCE 57 TRUCKS

Reduce Sag -- Burndown !

Reduce Annealing

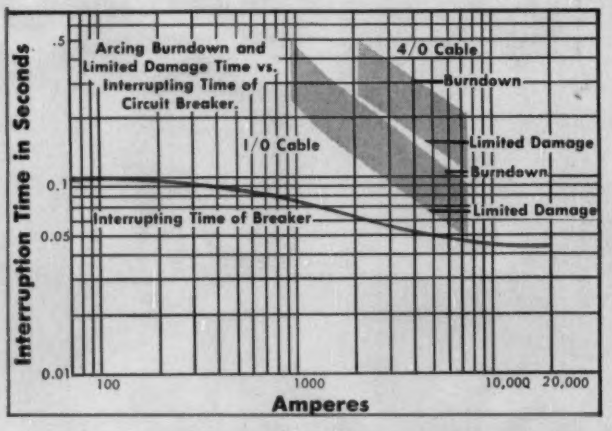
All Allis-Chalmers Air Magnetic Breakers are 5 cycle

NOW — 5 cycle interruption is standard on all Allis-Chalmers air magnetic breakers at no increase in price. Typical interruption curve for a *Ruptair* magnetic breaker is superimposed on a wire burndown characteristics chart shown below to illustrate the coordination that may be obtained with these Allis-Chalmers breakers.

The faster clearing time afforded by these breakers will reduce the effect of a fault on the system — reduce the problem of sagging wires, annealing and burndown.

All Allis-Chalmers switchgear assemblies and primary unit substations are equipped with these 5 cycle *Ruptair* breakers.

For further details contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



A commonly used overhead distribution wire is No. 4 wire. This curve shows no wire damage occurring when coordinated with this 5 cycle breaker. Notice that interrupting time is well under 5 cycles on heavier currents and is fast on low currents, too.

ALLIS-CHALMERS

A-5257

for progress in switchgear

Wheeler HI-OUTPUT FIXTURES

deliver more light per foot of lamp length!

HI-OUTPUT "D-8500" LINE FIXTURES by Wheeler—designed for use with 100 watt and 60 watt rapid start lamps operating at 800 MA.

Diffuser apertures provide a small upward component of light to relieve severe brightness contrast . . . and allow for heat dissipation.

Wheeler "D-8500" Hi-Output Fixtures are ideally suited for medium to high mounting applications.

Ask your electrical wholesaler — or write

Wheeler Reflector Company
DIVISION OF FRANKLIN RESEARCH CORP.
275 Congress Street, Boston 10, Mass.

Installation—Ucinite Div. of United-Carr Fastener Corp.

Another example of Wheeler's

"PACKAGE PLAN" LIGHTING —

the efficient, time-saving way to solve all your lighting requirements at one time . . . from one source!

Distributed Exclusively through Electrical Wholesalers

Philo Plant of Ohio Power Company on American Gas & Electric System. Stack in front is for the new Supercritical Unit.

B&W's Universal Pressure Steam Generator

Helps Philo Plant Open the Way to New Economies in Steam-Electric Generation

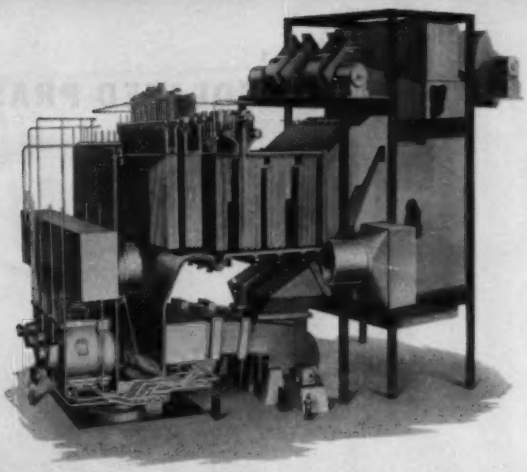
Generating history is being made at the Philo Plant of the Ohio Power Company on the American Gas & Electric System. Here, America's first commercial supercritical pressure steam-electric unit is in operation, probing the frontiers for new economies in the production of energy.

A Symbol of the Vision and progressiveness of America's public utilities and their suppliers, Philo is a landmark in engineering history. It is the result of years of engineering, research, and development that solved the many problems which had stood in the way of greater plant efficiency that comes with the highest possible combination of pressure and temperature.

The Problems Solved included the very difficult ones of feedwater chemistry, of heat transfer and control of internal deposits, metallurgy for higher temperatures combined with higher pressures, and development of control and operating techniques.

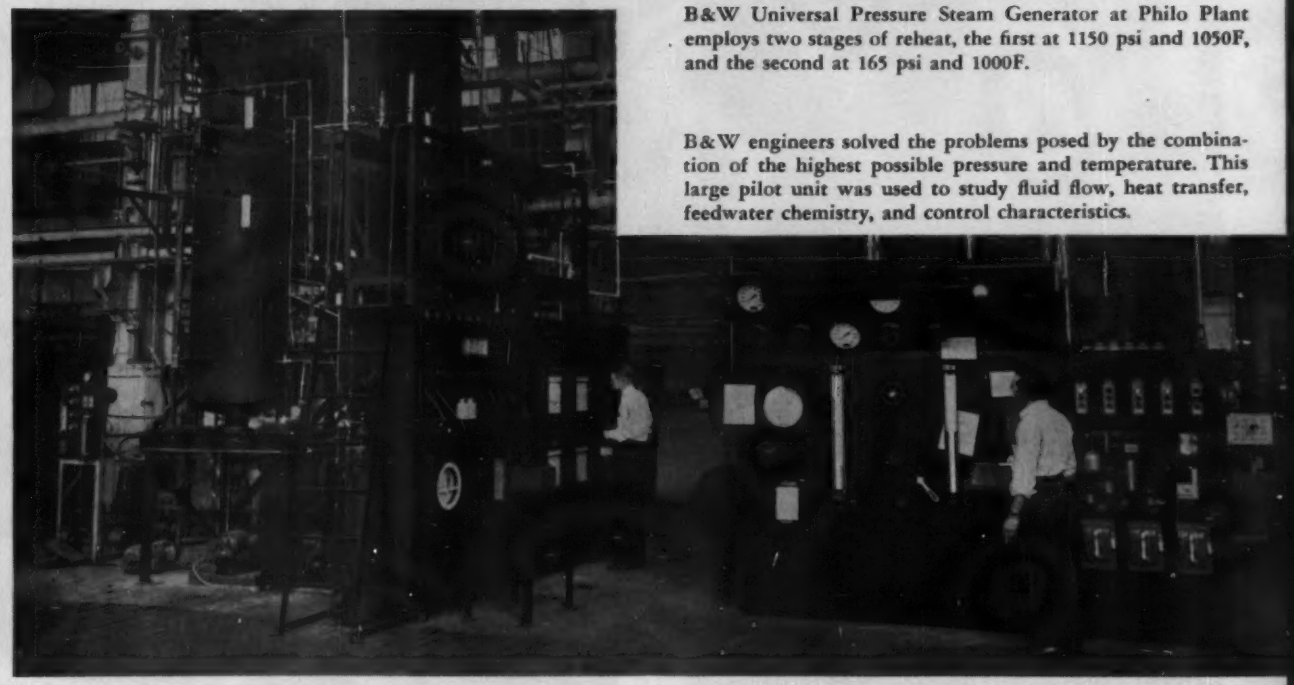
Philo's Supercritical Unit, with a turbo-generator operating at 4500 psi and 1150F, is producing over 120,000 kw, in the same space and using 45 per cent less fuel per kwhr than the 40,000 kw unit it replaced.

Three B&W Cyclone Furnaces assure rapid and complete combustion, with minimum fly ash discharge and maintenance.



B&W Universal Pressure Steam Generator at Philo Plant employs two stages of reheat, the first at 1150 psi and 1050F, and the second at 165 psi and 1000F.

B&W engineers solved the problems posed by the combination of the highest possible pressure and temperature. This large pilot unit was used to study fluid flow, heat transfer, feedwater chemistry, and control characteristics.



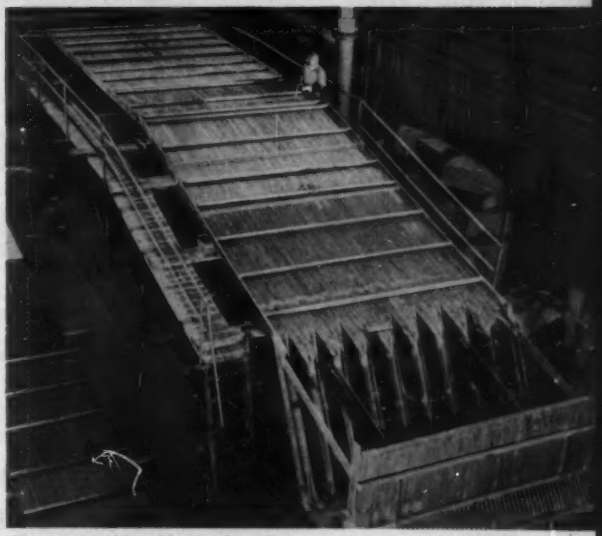
Two More B&W Universal Pressure Steam Generators are now being built for The American Gas & Electric System. Together these will produce 900,000 kw—enough to supply residential power for a city of 8,000,000. Like Philo, they will continue to push forward this new frontier in steam generation.

Nearly a Century of B&W leadership in steam generation stands behind these achievements. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-833-CS

BABCOCK & WILCOX

BOILER DIVISION



Shop assembly of secondary front wall. Pre-assembly of many components for the Universal Pressure Steam Generator greatly speeded field erection.

ISOLATED PHASE BUS

Typical assembly with sliding section open. Two-way sliding section provides easy access to connectors—simplifies inspection and maintenance—effects savings in installation and operation.

SO MUCH MORE FOR THE SAME MONEY

All isolated phase bus meets industry standards; performs satisfactorily at rated current, voltage and temperature rise, with standard impulse levels; sells at competitive prices. But when selecting isolated phase bus for generator or any other applications, it is necessary to consider cost, *plus* installation and operating advantages. Here are some of the superior inherent advantages of I-T-E Isolated Phase Bus design that are not covered by industry specifications, yet effect substantial savings in installation and operation:

Most Simple and Efficient Design thermally, electrically and mechanically.

Fewest and Most Durable Gaskets, meaning direct savings in installation time and maintenance.

Greatest Installation Flexibility.

Tightest Bus ever designed. Dust and water leakage are eliminated.

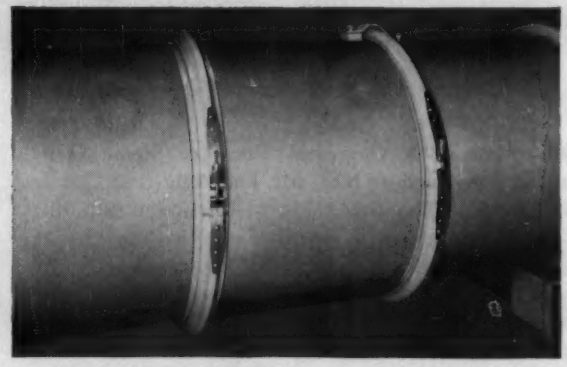
Lightweight. Save in installation time and labor. Also in building steel with supports and hardware.

Sliding Covers. Strategically located to insure stable mounting base for standard length and facilitate joint makeup and inspection when necessary.

Expert Engineering. Backed by more than 20 years' experience in the design and manufacture of isolated phase bus, insures quick, reliable engineering and excellent delivery.

Self-Cooled or Forced Air Cooled in ratings up to 14,000 amperes continuous.

Let us tell you more about I-T-E Isolated Phase Bus and its installation and operating advantages. Write for Bulletins 10004-A and 10004-B. I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa.



Typical assembly with sliding section closed. Closure requires only two 1-piece round lifetime gaskets—easy to place and remove. Simple, powerful V-clamp couplings distribute clamping pressure uniformly around ring.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES LTD.

"Better Penetration... Greater Coverage..."

—Say users of RCA 100-watt Carfone

New RCA Carfone "Fifty" 100-Watt 2-Way Radio

IN THE CITY—*better penetration*
IN THE COUNTRY—*greater coverage*

In congested metropolitan areas, for example, radio-equipped vehicles can operate with improved message intelligibility. The new RCA 100-watt Carfone mobile units for 25-54 mc have the power to help "override" the dead spots and communicate from within the radio "shadows" of tall buildings and high hills.

In the open country, too, RCA Carfone 100A equipment can provide broader coverage. It is designed to give a wide range and a fine signal at maximum distances, which means improved performance, throughout the system.

You can save time and money, avoid costly back-tracking and give your customers a real plus in service for extra profits by installing dependable RCA 2-Way Radio. The RCA Service organization is available to help you maintain peak performance from your communications equipment at all times. Mail coupon below for more information.

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☐ Please send me complete information on new RCA 2-Way Radio, CMF 100A Series.

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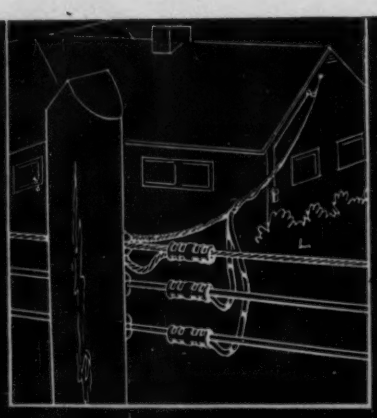
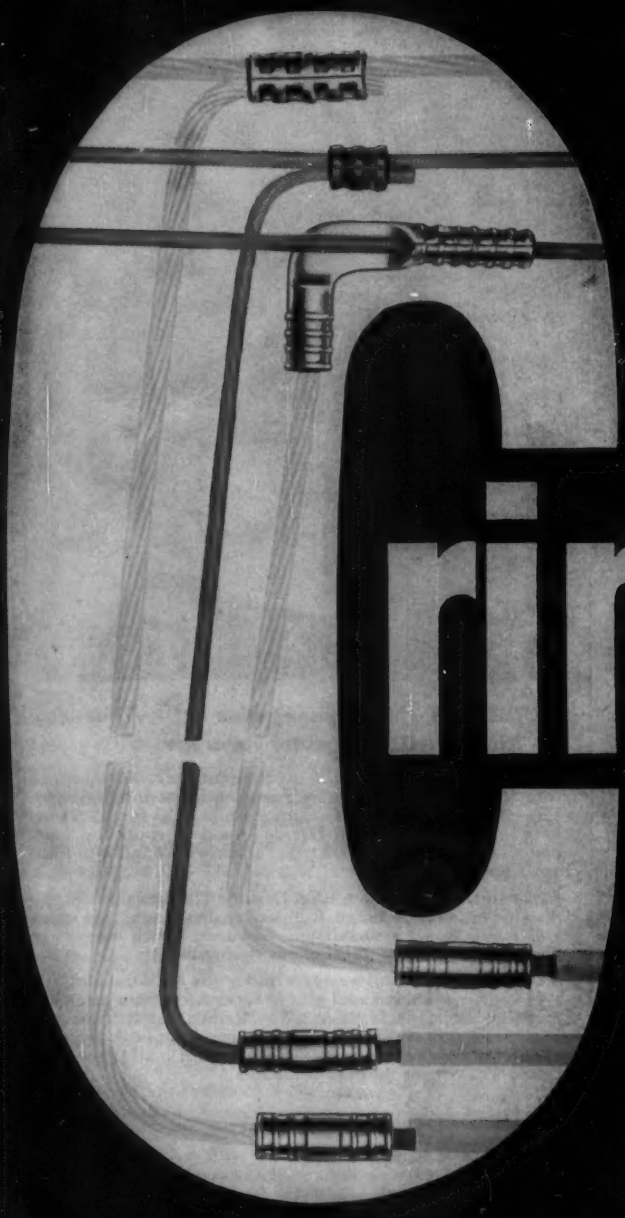
Do the job better!





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One hand or hydraulic tool... minimum die investment...and low-cost Crimpit line connectors will make every service connection from pole to house. Write for Crimpit bulletin.

BURNDY

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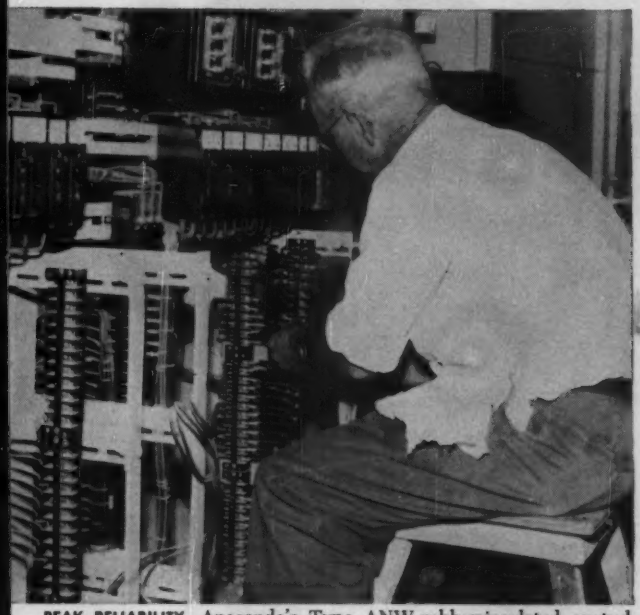
Norwalk, Connect. • Toronto, Canada • Factories: New York, California, Toronto • Export: Philips Export Company

Whatever you want in control cable—Anaconda has it!



PEAK RELIABILITY. Anaconda's Type ANW-rubber-insulated control cable is a high-quality product which features unusual heat resistance. It is also highly resistant to attack by moisture, acids, alkalies and other chemicals. Individual conductor covering and over-all jacket of neoprene.

MULTIPLE USE. Anaconda thermoplastic control cables can be installed aerially, in conduit, underground in ducts—or buried directly in the earth. They are available with either polyethylene (600 or 1000 volts) or Densheath* vinyl resin (600 volts) insulation and Densheath over-all jacket. Also with Densheath conductor covers on request.

OZONE-RESISTANCE. For station control applications where ozone conditions prevail, Anaconda offers a special low-voltage butyl-insulated cable. This control cable not only resists ozone, but individual conductor covering and over-all jacket of neoprene provide maximum insurance against moisture and mechanical injury.

SPACE-SAVER. You can install a 12-conductor cable in conduit now carrying a 6 or 7—with Anaconda Type PND† Control Cable. Individual conductor coverings of moisture-, oil- and gasoline-resistant nylon. Over-all Densheath jacket. Designed for general-purpose control requirements where space is a limiting factor.

Permanent Full Color Coding on rubber cables, by means of Anaconda's rubber-base coating, assures quick and positive circuit identification. Coding by surface printing, which conforms to IPCEA standards, also available. On thermoplastic cables, full color coding with pigmented insulation and surface printed coding are likewise offered. For information on any of Anaconda's Control Cables—including cables engineered for more specialized control requirements—see your Anaconda distributor or the Man from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. †Trademark 57389

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FOR CONTROL CABLE

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BRAND

Electrical Spring Connectors

With "live" Spring Action!

The "live" spring action of new "SCOTCHLOK" Type R Connectors holds wires in a bulldog grip. The *feel* of turning on a "SCOTCHLOK" is a sound test of its holding power. Here's everything you need for a one-step pig-tail: positive, vibration-proof connection; reinforcing steel shell; tough, pre-insulated vinyl cover; and a neat, compact splice.

FEEL THE GRIP! TRY TO PULL THEM OFF!

Send For Free Samples! See for yourself how good "SCOTCHLOK" Brand Type R Connectors really are! Just write on your letterhead and we'll send you free samples for testing. Address: 3M Company, St. Paul 6, Minn., Dept. BV-57.

The term "SCOTCHLOK" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N. Y. In Canada: P. O. Box 757, London, Ontario.

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RIGID STEEL CONDUIT

Specify National Electric Sherarduct and you safeguard electrical wiring against corrosion for all time.

NE's Sherardizing process of dry galvanizing under heat actually alloys corrosion resistant zinc with the steel walls of the conduit. Threads are machined before galvanizing so that the entire length of the conduit receives a uniform protective zinc coating from end to end.

On the job Sherarduct helps cut construction costs. A slick inside coating of Shera-enamel makes fishing and wire pulling easy. The gradual heating and cooling of the Sherardizing process anneals the steel conduit . . . develops the ductility needed for efficient bending and working.

On the next conduit installation remember — Sherardizing is Galvanizing at its best—Sherarduct is Galvanized conduit at its best.

National Electric Products

PITTSBURGH, PA.
2 Plants • 12 Warehouses
41 Sales Offices

New Bell Telephone Building, Gateway Center, Pittsburgh, Pa., showing main vertical conduit runs of Sherarduct. Architects: Press C. & William C. Dowler. General Contractor: Mellon-Stuart Company. Electrical Contractor: Franklin Electric Company. Electrical Engineer: Carl J. Long.

P. P. #66200
6" STRAIN INSULATORS
EEI-NEMA CLASS 52-1

RECOGNIZED RELIABILITY

LOOK AT IT *FROM EVERY ANGLE*

Our insulators are the ultimate in design — **FIELD TESTED** and **FIELD PROVEN,** assuring ruggedness and durability.

There's more working space between the edge of the skirt and center of stud eye; extra long clevis pin to aid linemen in construction and Hot Line maintenance; highest quality Forged Steel or Malleable Iron, double dipped, hot galvanized hardware components — dimensionally standard facilitating complete interchangeability.

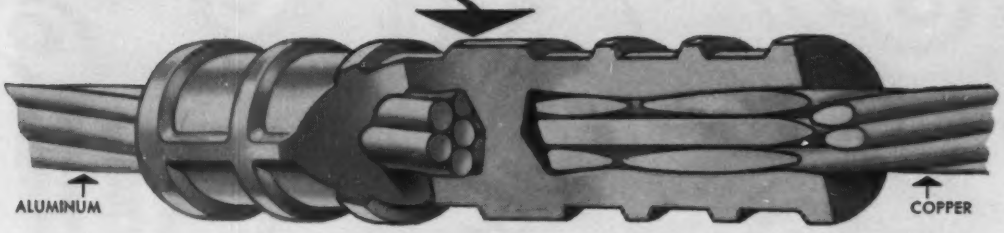
Prior to assembly all shells are **DOUBLE TESTED** electrically, 3-5 seconds of high frequency plus 3-5 minutes of 60 cycle flashover. After assembly each unit is Pull Tested to 50% of its rating (5000#), then given a **FINAL ELECTRICAL TEST** (12-15 seconds of high frequency flashover) prior to packing.

Look at it from **YOUR** angle — buy **RECOGNIZED RELIABILITY — BUY PORCELAIN PRODUCTS INSULATORS.**

PP INC.

Porcelain Products, Inc.
High Voltage Division **Parkersburg, W. Va.**

the barrier that gives you 3 definite advantages



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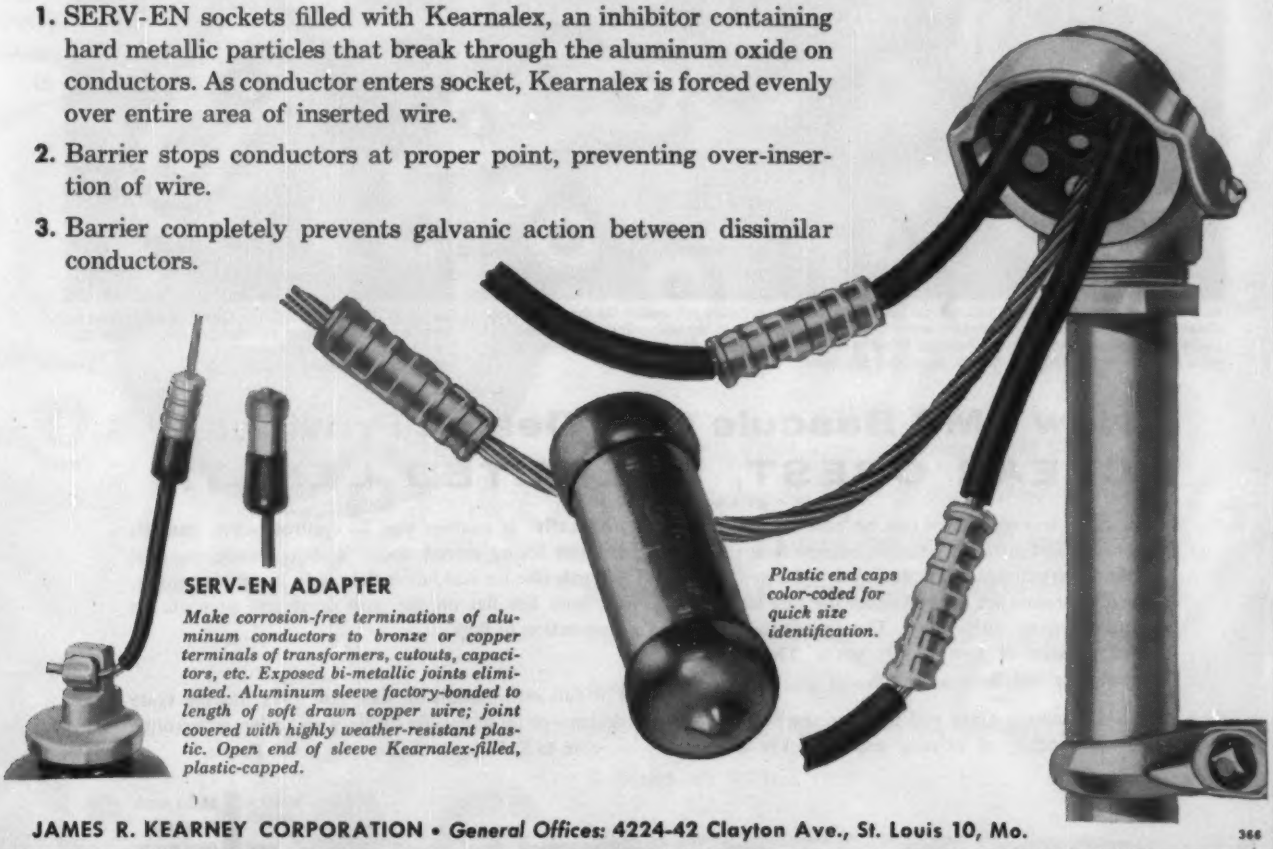
SERVICE ENTRANCE SLEEVES

—outstanding compression connectors for splicing all combinations of ACSR, aluminum and copper for service entrances

1. SERV-EN sockets filled with Kearnalex, an inhibitor containing hard metallic particles that break through the aluminum oxide on conductors. As conductor enters socket, Kearnalex is forced evenly over entire area of inserted wire.
2. Barrier stops conductors at proper point, preventing over-insertion of wire.
3. Barrier completely prevents galvanic action between dissimilar conductors.



SERV-EN ADAPTER

Make corrosion-free terminations of aluminum conductors to bronze or copper terminals of transformers, cutouts, capacitors, etc. Exposed bi-metallic joints eliminated. Aluminum sleeve factory-bonded to length of soft drawn copper wire; joint covered with highly weather-resistant plastic. Open end of sleeve Kearnalex-filled, plastic-capped.

Plastic end caps color-coded for quick size identification.

JAMES R. KEARNEY CORPORATION • ***General Offices:*** **4224-42 Clayton Ave., St. Louis 10, Mo.**

366

for BETTER CONSTRUCTION
SAFER MAINTENANCE

Specify **KEARNEY PRODUCTS**

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

The Mark of Quality

Installation of these two 5'-high SMS Bascule Gates on a dam 28' in height will enable the City of Decatur, Illinois, to more than double its present water storage capacity, even in dry years. The training wall and concrete pier between the gates is designed to minimize downstream cross-flow and damage to the apron. Harza Engineering Co., Chicago, Illinois, Consulting Engineers.

Individual 29'-long sections of the gate are installed in graphited bronze bearing shoes. A Bascule Gate was chosen over other types here when engineering studies proved it most economical and simplest.

View from downstream side shows final connection of one of the several hydraulic operating cylinders for each gate. Piping on the face of the dam immediately below provides individual isolation of any cylinder.

One of the two 500 psi oil accumulator tanks is about to be raised into position at the control station. Pumps supply pressure to the accumulator tanks for emergency operation in the event of power failure.

New SMS Bascule Gate Design Provides a CLEAR CREST, UNLIMITED LENGTH

Now SMS Bascule Gates can be built to any length you need, and installed without intermediate piers or overhead structures. With this new SMS design, hydraulic operators are located under the gate leaves and controlled from either end. The installation shown above consists of two 233'9" gates. They are the longest ever installed.

An SMS Bascule Gate will increase the storage and spillway capacity of existing dams quickly and economically. It enables you to control heavy run-offs without losing stored water, and to handle regional hazards like ice and heavy debris. In its open position, the gate lies flat on the dam crest and presents no obstruction to flow.

For full information on this new SMS Bascule Gate design—or on hydraulic turbines and other accessories—write to S. Morgan Smith Co., York, Penna.

SMS

S. MORGAN SMITH

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

HYDRAULIC TURBINES
GATES & HOISTS
TRASH RAKES
PUMPS
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BALL VALVES
CONTROLLABLE-PITCH SHIP PROPELLERS
BUTTERFLY VALVES

. . . at no additional cost

Every Central distribution transformer, 100 KVA and below, is impulse tested on the production line. This – the last inspection step before shipment – is preceded by all standard NEMA and ASA tests. Precision manufacture and rigid inspection without premium costs are important reasons why more and more Central transformers are specified. Your inquiries are invited.

Designers and Manufacturers of Transformers Only

Central TRANSFORMER CORP.

PINE BLUFF, ARKANSAS *Sales Offices in Principal Cities*

A TYPE FOR EVERY NEED . . .
FROM THE SMALLEST TO THE LARGEST

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR

This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

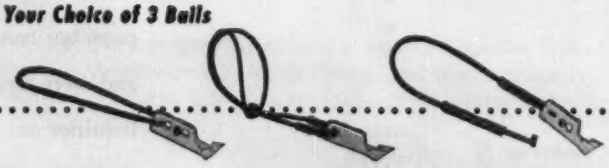
Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails



STANDARD FLEXIBLE CAPTURED FLEXIBLE FREE

JASPER BLACKBURN CORPORATION 35 MADISON STREET • ST. LOUIS • MAIN 1-2821

Mr. Public Utility
Industrial Salesman

How do YOU live with these facts ?

Any voltage variation

from nameplate rating of an electrical device causes a sacrifice either in life or performance of the equipment.

Minor voltage fluctuations

applied to automatic control devices can nullify the most costly engineering and design investment and can ruin work in process worth many times the cost of proper automatic voltage regulation equipment.

A ten percent undervoltage

results in:

- . . . 19% decrease in heat output of resistance heaters.
- . . . 20% decrease in fluorescent lamp life and 15% decrease in light output.
- . . . 19% decrease in starting and maximum running torque of induction motors.
- . . . drastic reduction in electronic tube life.
- . . . sluggish solenoids and timers that result in rejects and process re-cycling.

Each five percent overvoltage

reduces the cathode life of electronic tubes by 50% . . . shortens life of mercury vapor lamps by overheating . . . affects lamp transformers.

A ten percent overvoltage

results in:

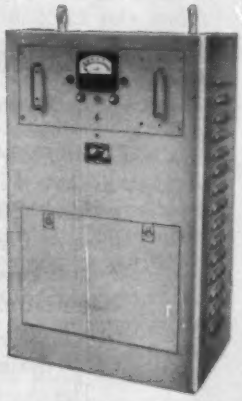
- . . . 10 to 12% increase in induction motor starting current, increasing torque, and causing lighting to flicker.
- . . . 70% reduction in incandescent lamp life — tripling lamp replacement costs.
- . . . 20% reduction in fluorescent lamp life.
- . . . 20% reduction in corrective capacity of capacitors thereby losing the benefit of 20% of the capacitor investment.

These are facts of life that can haunt a conscientious, hard-working Public Utility Industrial salesman.

They can be creating those constant, annoying troubles whose cause frequently cannot be traced — but for which you have your hat pulled down over your eyes by irate customers.

Even though these troubles may not be the result of generating or transmission faults, it is still tough to admit your product isn't perfect — or is it? Plant management today is learning more and more about *Varying Voltage Troubles.* It is high on their check list of troubles. They look to you to spot this troublemaker first — *and recommend the use of a good automatic voltage regulator.*

For all industrial production or laboratory uses of 100 KVA or less, you'll find a mechanically rugged and control sensitive STABILINE Automatic Voltage Regulator ideal for the job. Carry a STABILINE bulletin in your brief case. It will help you live with a lot of problems that previously haunted you. It will help you build more solid customer relations.



STABILINE holds output voltage constant . . . and ends production troubles caused by voltage variations.

Be sure to see SUPERIOR ELECTRIC'S Mobile Display when it is in your area

THE SUPERIOR ELECTRIC COMPANY

2105 BRADLEY AVENUE, BRISTOL, CONNECTICUT

Please send STABILINE Bulletin S657 ☐ Have your representative call ☐

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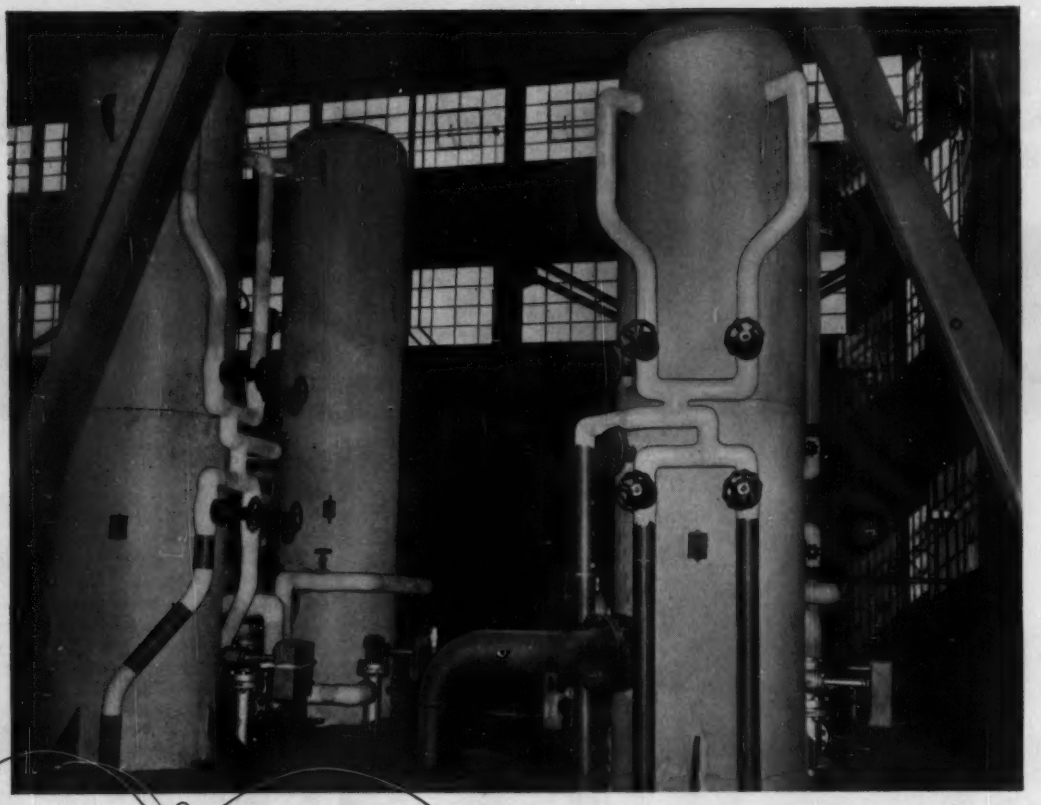


FIRST ALL-WELDED FEEDWATER HEATERS

installed at Schiller Station, Public Service of New Hampshire

THE INSTALLATION shown above consists of two 175 psi low-pressure and two *all-welded*, 2000 psi high-pressure feedwater heaters installed at the Schiller Station of Public Service Company, Portsmouth, New Hampshire. The high-pressure heaters are the first units of the new FW all-welded "bottle-tight" design ever put into service.

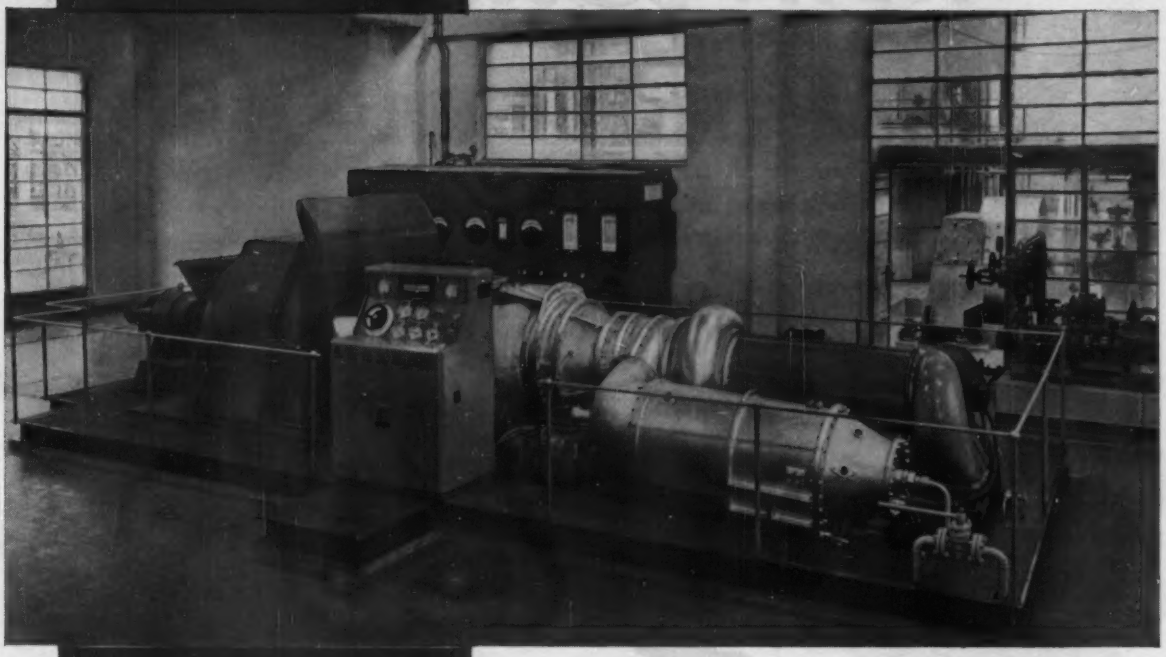
The chief advantage of the all-welded construction is the elimination of all maintenance problems presented by bolted and gasketed joints. Quicker start-ups are possible because there is no danger of leakage under severe thermal shocks. The shell-to-adapter joints, tube-to-tubesheet joints and the closure are all welded. Each of these welds has been successfully field tested for at least six years on other equipment.

The new Foster Wheeler all-welded feedwater heater can provide *you* with positive protection against gasket leaks and gasket maintenance. For further information, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

NOW for the first time...



The Mark TA gas turbine generating power and process steam in a refining application.

all power services in one package

In applications where multiple power services are required such as power generation, compressing, pumping, space heating, refrigeration, air conditioning, drying, or evaporating, the Clark Mark TA gas turbine is the economical choice.

Exhaust gases from this 1,150 bhp. gas turbine contain up to 10,000,000 BTU/H of recoverable energy at a temperature of 870°F. While these gases contain some products of combustion, 90% of the original oxygen content is still present.

The exhaust gases are useful where preheated air is desirable for combustion or supercharging purposes, for drying applications, catalyst regeneration, feedwater heating, evaporation of sea water, etc. These gases can also be used in air to air heat exchangers for space heating or to generate up to 9,500 pounds of low pressure steam per hour for process use. If even higher temperature gases are required, the Mark TA can be used solely as a power gas generator to provide gases of 1020°F at 20-22 psia. and a mass flow of 20 pounds per second.

For large stores, auditoriums, hotels, hospitals and office buildings, the Mark TA can provide approximately 1800 tons of air conditioning or refrigeration in the summer using the absorption cycle and also provide steam for heating in the winter. In all applications except power gas generating, this modern gas turbine also supplies 1,150 bhp. of rotative energy for pump, generator, or compressor drive.

Clark engineers stand ready to assist you in applying the Mark TA gas turbine to your application. Larger units with ratings of 9,500 bhp. are also available from Clark. Write for Bulletin No. 142.

CLARK BROS. CO., OLEAN, N.Y.
One of the Dresser Industries
Offices in Principal Cities Throughout the World

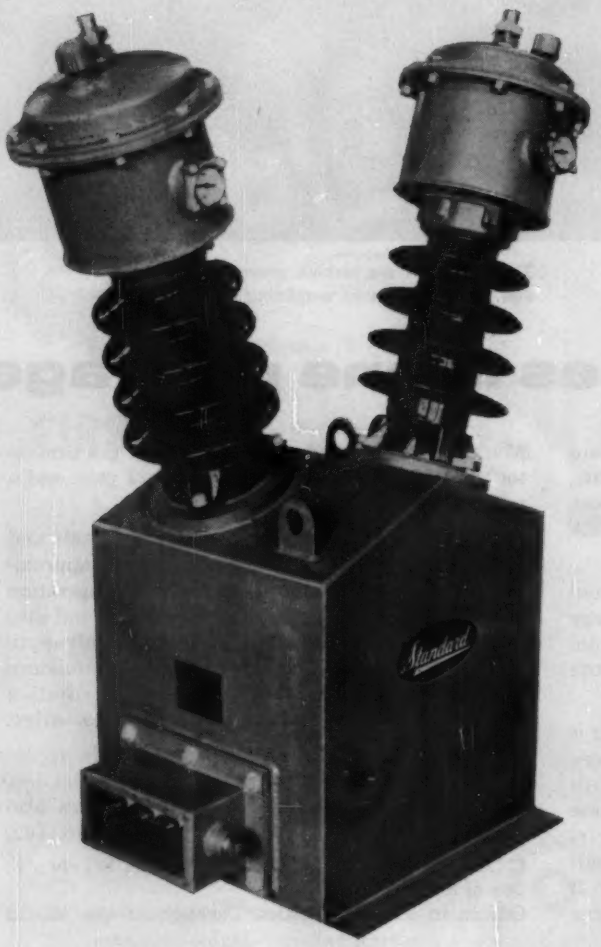
Clark Bros. Co. is licensed to manufacture the Mark TA gas turbine in this country by Ruston-Hornsby, Ltd., Lincoln, England.

CLARK

NEW! Standard®

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. Most models can be mounted in any position.

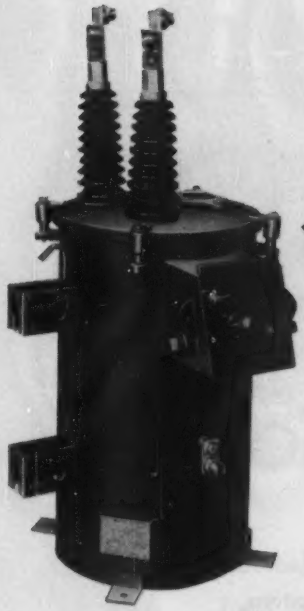
The new line meets all ASA, EEI, and NEMA mounting and accuracy standards. Transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard representative or write directly to us. You'll increase your accuracy at the point that counts—ahead of and at the meter!



TYPE PXO OISC POTENTIAL TRANSFORMER
— outdoor type. 34,500 volts primary, 120 volts secondary. For platform mounting.

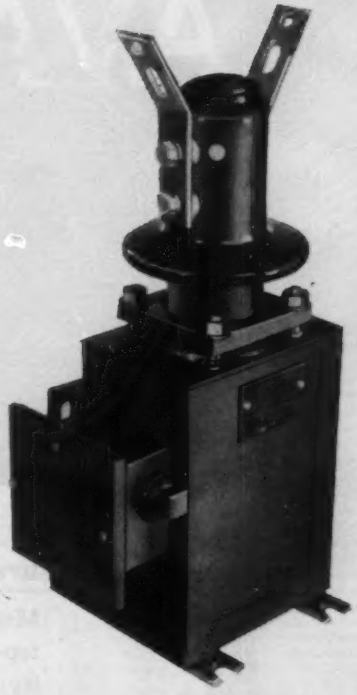
TYPE CXO OISC CURRENT TRANSFORMER
— outdoor type. 72,000 volts, 200/400 to 5 amperes, 350 KV FW impulse level. With oil level indicator, primary bypass protector, and secondary terminal box.

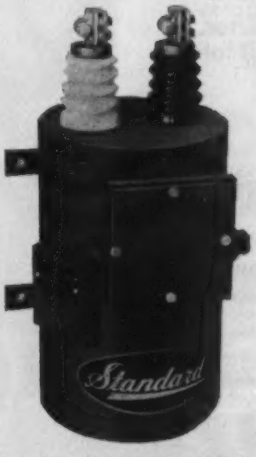
OUTDOOR METERING TRANSFORMERS



TYPE PWO OISC POTENTIAL TRANSFORMER— outdoor, 14,400 to 120 volts, 15 KV insulation class, 110 KV FW impulse level, pole or platform mounting.

TYPE OCO CURRENT TRANSFORMER — outdoor type, compound filled, for high accuracy relaying and metering service. 5 KV to 15 KV insulation class; 60 to 110 KV full wave impulse levels, 10 through 800 amperes.





TYPE PWD POTENTIAL TRANSFORMER — outdoor type. Compound filled. 2400 volts primary. Equipped with brackets for pole or cross-arm mounting. Secondary terminal chamber. Also available at 4800 volt rating, 60 KV impulse level.

TYPE CWD-1 CURRENT TRANSFORMER— outdoor type, compound filled, for 5000 volt service furnished in ratios 10 through 800 amperes.

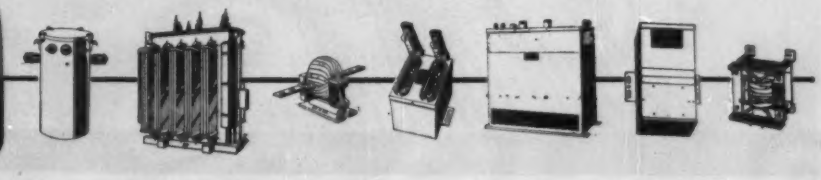
Standard®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Transformers FOR EVERY APPLICATION



in these days of BIG units...

AVAILABILITY

in your

One sure way to reduce generation costs

More hours-per-year *in service* for your large, modern, top-efficiency units – in other words, higher availability . . . higher use factor . . . higher capacity factor. That's the answer to lower cost per kilowatt-hour.

One way to assure higher availability

C-E Utility Boilers are designed and built to assure optimum continuity of service. But let *facts* speak for themselves. On the opposite page is the composite record of 103 C-E Reheat Boilers, covering cumulative service periods up to eight years.

COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

C-E

B-996

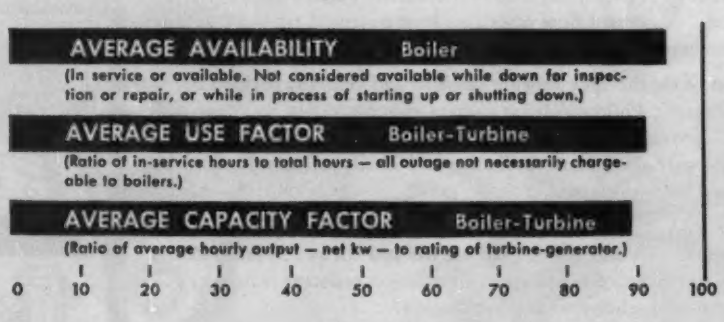
ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS

is the No. 1 factor generation costs

OPERATING RECORD OF 103 C-E REHEAT BOILERS

The first of these boilers was placed in service in 1949. By the end of 1956, one hundred and three units were "on the line." Significant data concerning these boilers which, in this report, are all private utility units, are summarized below.

Number of Units	103
Total Capacity — Mw	11,265
Average Capacity per Unit — Mw	109
Total Boiler Time — Hours	2,635,524
— Years	307


AVERAGE AVAILABILITY Boiler
(In service or available. Not considered available while down for inspection or repair, or while in process of starting up or shutting down.)
95.78%
AVERAGE USE FACTOR Boiler-Turbine
(Ratio of in-service hours to total hours — all outage not necessarily chargeable to boilers.)
90.40%
AVERAGE CAPACITY FACTOR Boiler-Turbine
(Ratio of average hourly output — net kw — to rating of turbine-generator.)
89.60%
0 10 20 30 40 50 60 70 80 90 100

PER CENT TOTAL HOURS OF OUTAGE

Inspection	2.72%
Boiler — Superheater — Reheater — Economizer — Desuperheater — Air Heater — Fuel Burning Equipment	0.95%
Auxiliary Equipment — Valves — Fans — Soot Blower — Miscellaneous	0.55%
TOTAL	4.22%

PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

Centralize Observation of Bulk Materials Handling

with Picture-Perfect
PHILCO *Industrial TV*

Now—one man, at a central control point, can maintain constant watch over your entire materials handling operation . . . control flow rates . . . spot potential tie-ups . . . take preventive measures *before* emergencies develop.

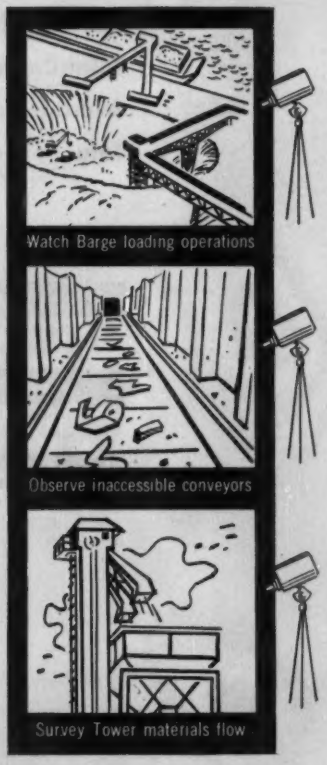
Virtually any combination of on-the-spot viewing cameras and centrally located monitors can be used. The lightweight Philco Vidicon camera mounts easily to cover each important field of vision . . . provides unmatched picture quality and accuracy of detail, even in low light levels. Compare the picture brilliance and clarity of new Philco ITV before you order ANY closed circuit system.

Philco's complete line of ITV accessories permits maximum flexibility and remote control for your system. Remote pan and tilt . . . remote iris and focus . . . Auto-Zoom lenses . . . lens turrets . . . weather-proof housings . . . explosion resistant housings . . . assure complete versatility and adaptability to any installation.

Here is positive surveillance for control in even the most hazardous or inaccessible locations. And power consumption is low . . . total hourly power consumption for an entire system is actually lower than that required to operate a household toaster.

To help control bulk materials handling efficiently and economically . . . specify Philco ITV.

Send for illustrated brochure, describing complete Philco ITV equipment and systems.



PHILCO®

GOVERNMENT AND INDUSTRIAL DIVISION
PHILADELPHIA 44, PENNSYLVANIA

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

Your Westinghouse representative can prove...

NEW TRANSFORMER DESIGN ELIMINATES 18 SOURCES OF CORROSION

Dome cover with new eye-bolt I-beam construction plus new internally mounted H. V. and L. V. bushings eliminate corrosive hardware. Patented "Coastal Finish"—toughest, stubbornest protection you can buy—makes these transformers corrosion-proof.

J-70794

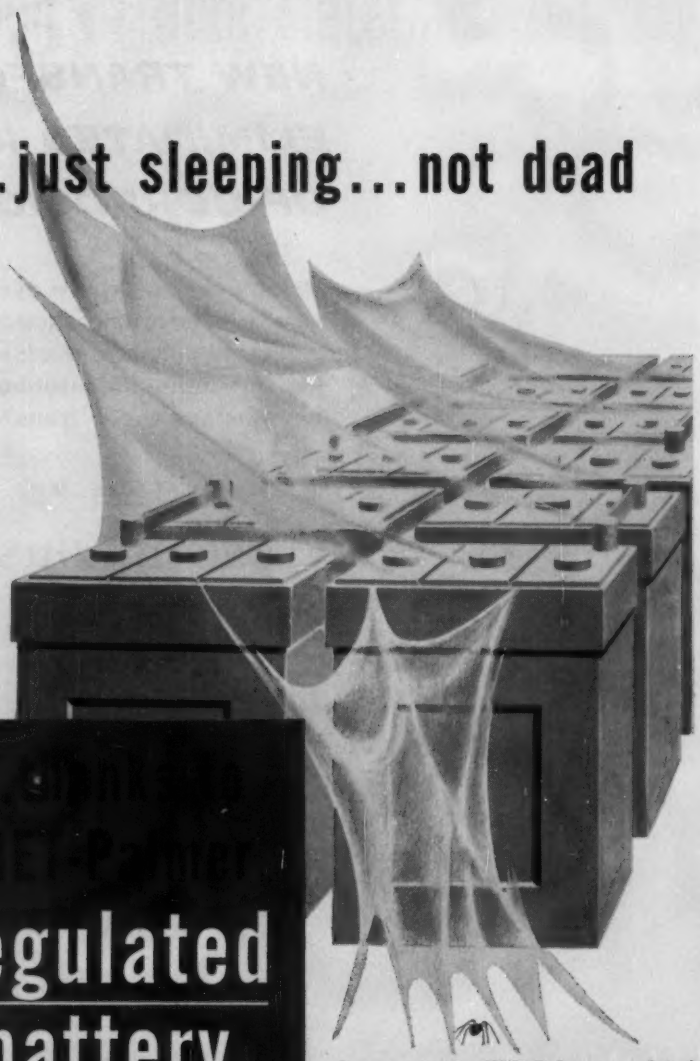
YOU CAN BE SURE...IF IT'S

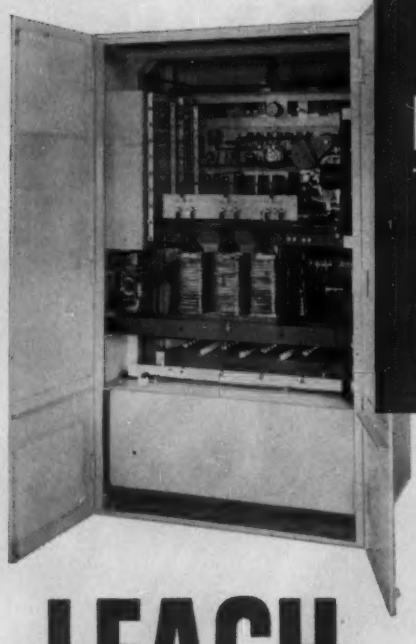
Westinghouse

Sam Waters, Westinghouse representative, demonstrates to Jack Evans, General Purchasing Agent, Ohio Edison, the volume of corrosive hardware removed from new line of Westinghouse transformers.

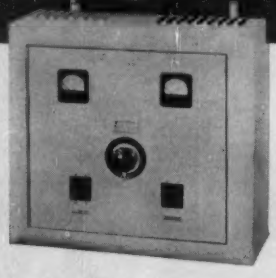
standby power...just sleeping...not dead

Yes, it's mighty quiet in most battery rooms, but if service continuity is to be maintained, every cell must be ready *at all times* to spring to immediate action. For dependable switchgear operation . . . and for railway signalling, alarms, communication equipment and the other applications where *positive performance* of storage batteries is vital . . . more and more utilities and industries are finding that INET-Palmer *Regulated* Battery Chargers are the best form of insurance. And, one of the least expensive. Completely unattended, they guard batteries against sulfation and discharge . . . make sure *24 hours a day* that standby power, on those rare occasions when it's needed, is always ready.





regulated battery chargers



6 reasons why INET-Palmer regulated chargers are your BEST BUY...

COMPLETELY AUTOMATIC . . . operates unattended; no operator required.

DEPENDABLE . . . no moving parts or vacuum tubes used in circuits.

STABLE . . . less than ±1% variation from no-load to full-load despite ±10% *simultaneous* input variation.

EASY INSTALLATION . . . floor, wall, or panel models available.

WIDE RATING RANGE . . . 3 to 60 cells in ratings to 50 KW.

LOW OPERATING COST . . . nothing to wear out, nothing to maintain.

Send today for Bulletin T-1100 containing complete specifications.

LEACH CORPORATION | INET-PALMER DIVISION

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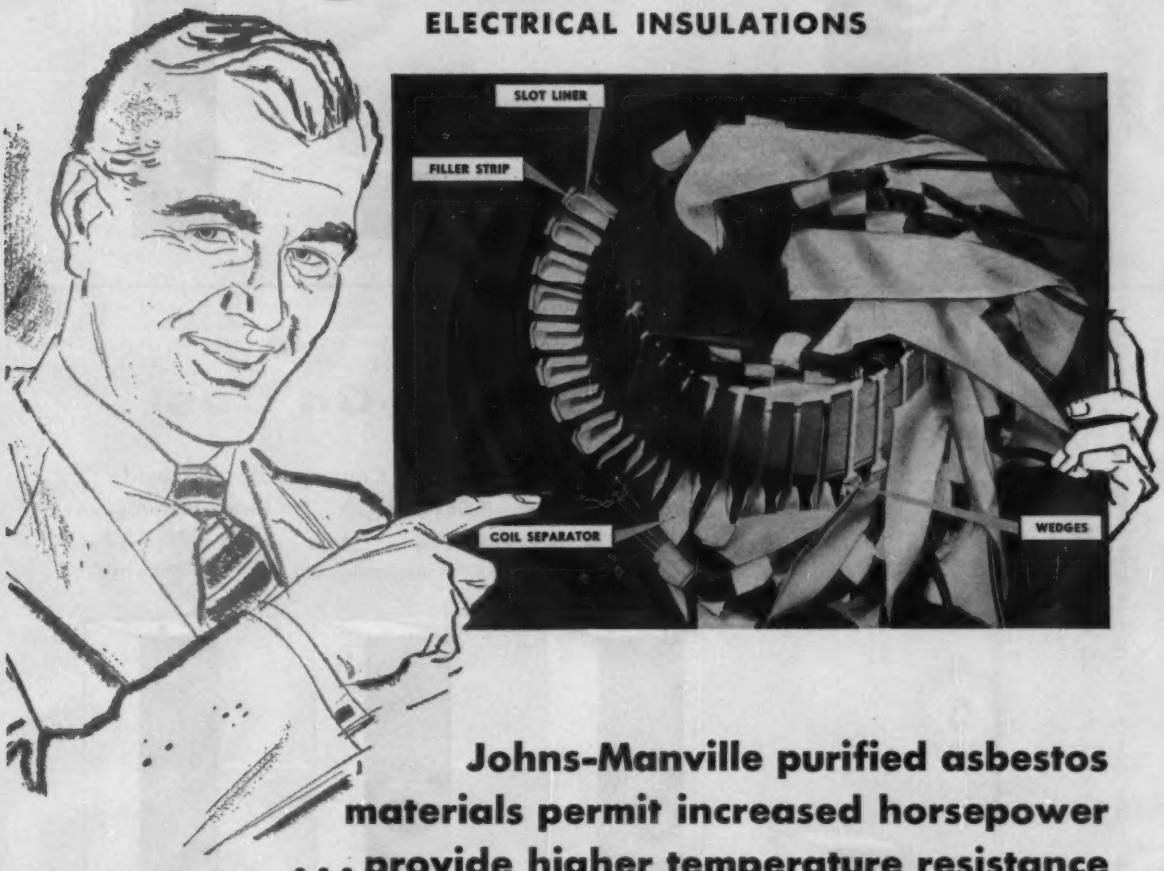
DISTRICT OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES OF U. S. AND CANADA

Smaller motors carry bigger loads when you insulate with

Quinterra®

ELECTRICAL INSULATIONS



Johns-Manville purified asbestos materials permit increased horsepower . . . provide higher temperature resistance

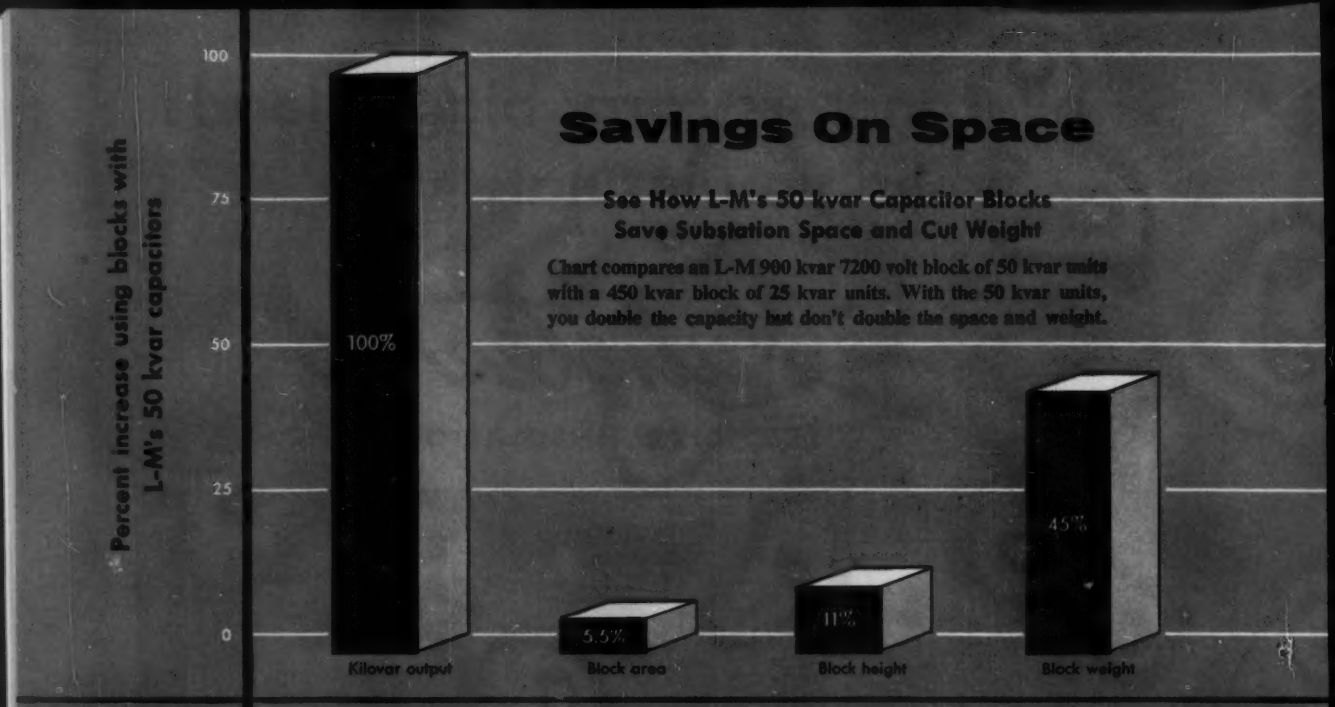
MOTORS insulated with Quinterra will outperform others of substantially higher rating but with less heat-resistant insulation.

The above photograph shows how you can use *Quinterra* and its companion product *Quinterrabord*® on a standard Class H induction motor. *Quinterra* Type 3-GR was employed for slot liners and coil separators. Wedges and filler strips are of *Quinterrabord* Type 3. Both materials are made from highly purified asbestos fibres treated with silicone resin for the highest combination of dielectric strength and pyrolysis resistance obtainable. In addition, Type 3-GR is reinforced with a strengthening layer of fine glass cloth.

Johns-Manville has developed a complete line of *Quinterra* materials for application in motors, transformers and other electrical apparatus. For further information write for brochure EL-40A. Address Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

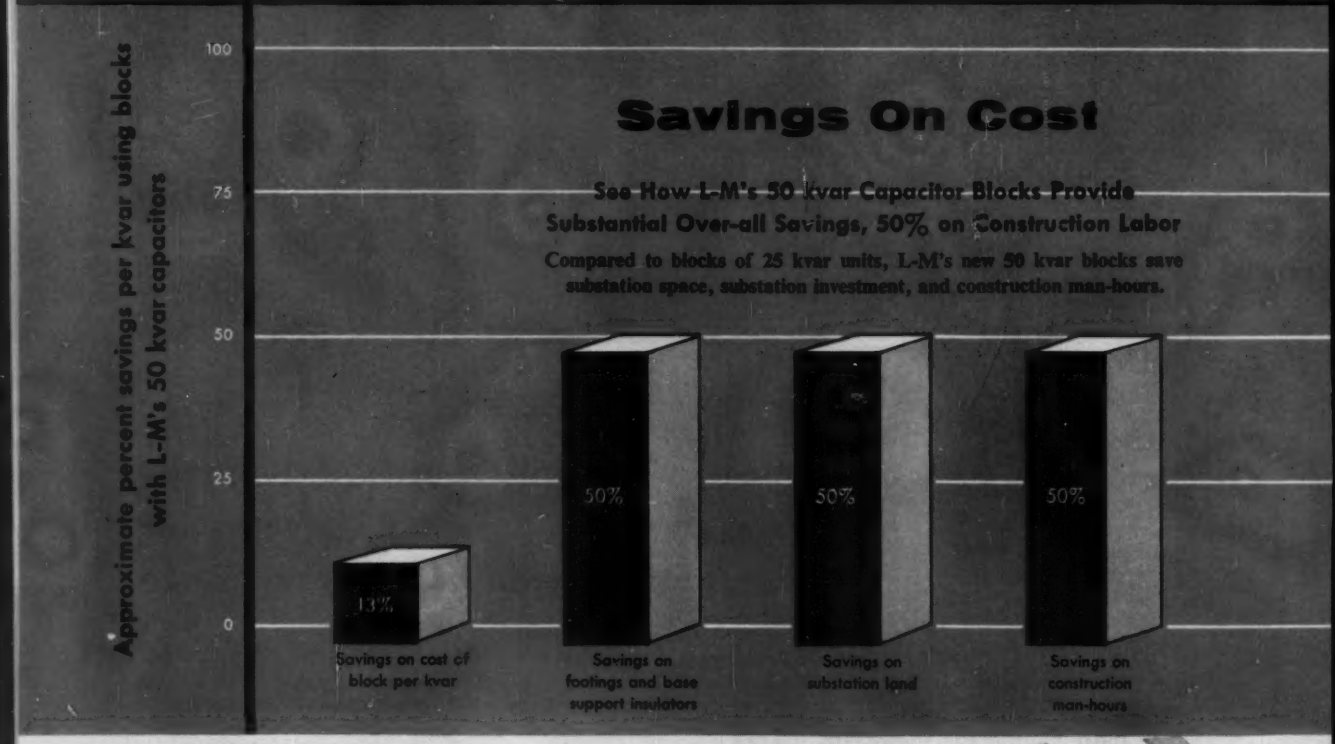
Johns-Manville ELECTRICAL INSULATIONS



Savings On Space

See How L-M's 50 kvar Capacitor Blocks Save Substation Space and Cut Weight

Chart compares an L-M 900 kvar 7200 volt block of 50 kvar units with a 450 kvar block of 25 kvar units. With the 50 kvar units, you double the capacity but don't double the space and weight.



Savings On Cost

See How L-M's 50 kvar Capacitor Blocks Provide Substantial Over-all Savings, 50% on Construction Labor

Compared to blocks of 25 kvar units, L-M's new 50 kvar blocks save substation space, substation investment, and construction man-hours.

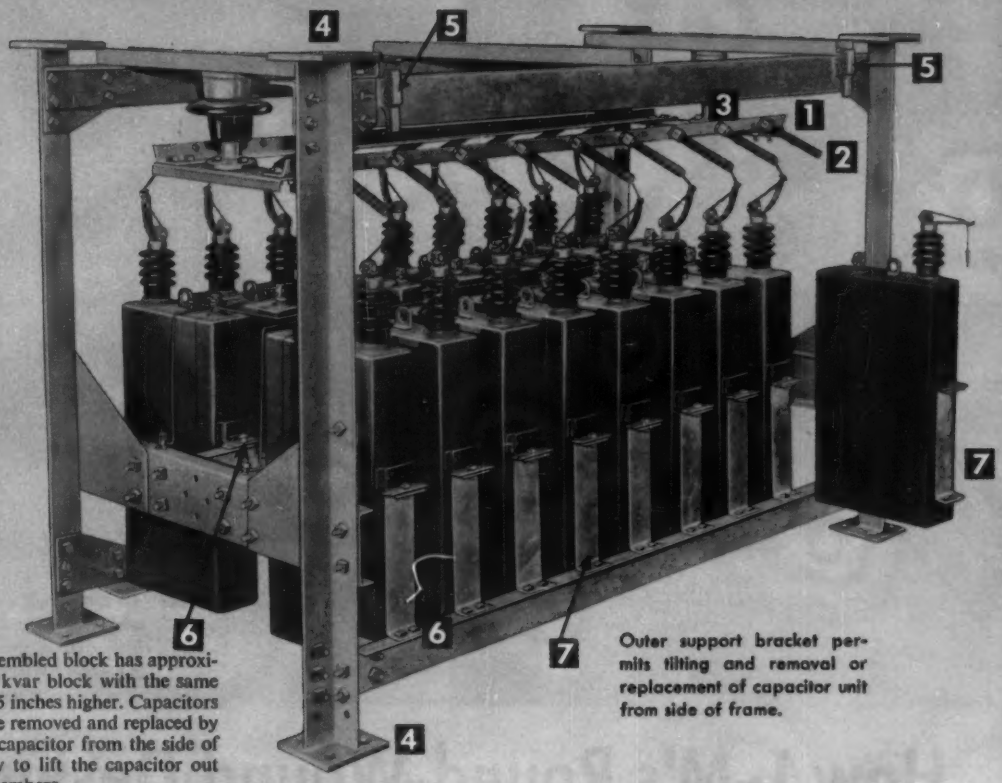
ANOTHER L-M CAPACITOR FIRST...

Units Now Shipped in New "Tear Strip" Carton

All individual L-M capacitor units are now packed in cartons that can be quickly and easily removed.

The new carton has a reinforced cloth tape cemented around the inside about two inches above the bottom. The tape is attached to pull tabs on the outside of the carton. When the tab is pulled, the tape makes a cut completely around the carton. The carton can then be quickly and easily lifted off the capacitor.

Simply pull the tape—to remove the carton.


1 Aluminum-alloy bus
2 Bus-mounted fuses
3 Bus connections wire brushed and treated with oxidation inhibitor.
4 Jig-assembled for perfect alignment of mounting pad bolt holes.
5 Lifting lugs.
6 Tapped holes in frame for capacitor mounting bolts. Nuts not needed.
7 Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

Another L-M First...

L-M's New 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Industries

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA Standard 50 kvar capacitor equipments. Prompt delivery . . . on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Industries, Milwaukee 1, Wisconsin.

McGRAW EDISON

LINE MATERIAL Industries Elemex® Capacitors
McGRAW-EDISON COMPANY

L-M transformers provide balanced performance which results in low losses. Extremely quiet operation is another advantage. L-M's new obround tank design, shown here, retains all outstanding Round-Wound performance characteristics.

How L-M's Round-Wound® Design Assures Consistently Low Losses, Greater Revenue

L-M's wound-core, round-coil construction provides the most efficient design for low losses, good regulation, greater revenue at all power factors.

By **R. W. HARTSOOK**
Chief Engineer
Small Distribution
Transformers
Line Material Company

One of the most important objectives in transformer design is to achieve a balance of low copper loss, low exciting current, and low core loss without sacrificing other desirable performance characteristics. The Round-Wound design has many inherent advantages that aid the designer in achieving this objective.

Round-Wound Design Offers Balanced Performance

L-M's Round-Wound transformer design consists of a wound core, with a cruciform cross section closely approximating a round form. Long round coils are wound directly onto the wound core. This construction gives L-M transformers inherent advantages to minimize losses and offer balanced performance.

Low Copper Loss

In the Round-Wound transformer, the core cross section is nearly round. As shown in Figure 4 at right, a round core has a much smaller perimeter than a rectangular core of the same cross-sectional area. Therefore the turns in a Round-Wound coil are shorter. (Figs. 2 and 3). With the same cross-section wire and the same number of turns, there is less total length of wire and less watts of copper loss.

In addition, the higher efficiency of the core-coil arrangement actually permits fewer turns. The combination of smaller turn diameters and fewer turns results in low reactance and impedance, giving the desirable regulation indicated by the curves in Figure 1.

High Overload Capacity

Low copper loss also contributes to better overload capacity, since copper loss watts increase as the square of the overload on a transformer. Therefore any reduction in copper loss results in a substantial increase in overload capacity. This is a bonus over the excellent overload capacity of the Round-Wound transformer resulting from its exceptionally good cooling characteristics.

Low Exciting Current, Low Core Loss

L-M's core is tightly wound of a continuous strip of oriented steel. Coils are wound directly onto this core by means of L-M's exclusive winding machine. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This construction results in low exciting current and high magnetic efficiency of the core.

Quiet Operation

L-M's wound-core construction eliminates all laps, flaps and gaps in the laminations. This contributes greatly to the extremely quiet operation of L-M's Round-Wound transformer.

Get Details on L-M's Round-Wound Transformers

Ask the L-M Field Engineer for complete information on L-M's Round-Wound design, and bulletins. Or write Line Material Company, Transformer Division, Zanesville, Ohio.

LINE MATERIAL
McGRAW-EDISON COMPANY

L-M's wound-core, round-coil construction provides exceptionally good cooling for high overload capacity and almost an ideal magnetic circuit to minimize losses.

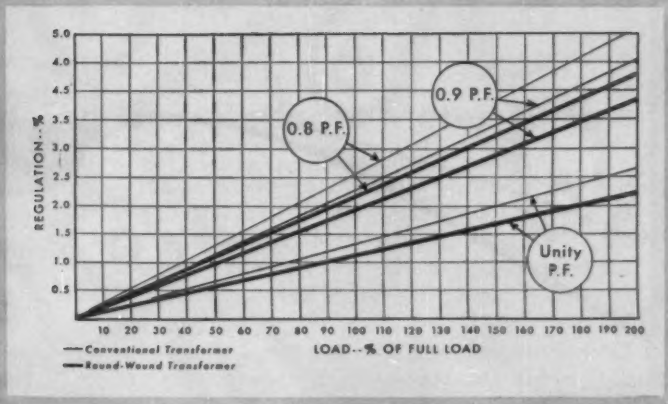


Fig. 1. Round-Wound offers good regulation at all power factors. Regulation of new 25 kva 2400-120/240 volt Round-Wound transformer compared with that of older design, showing effect of load and power factor on regulation. Multiply the difference in regulation by the number of old distribution transformers on your system, and see how much more revenue these modern L-M transformers produce.

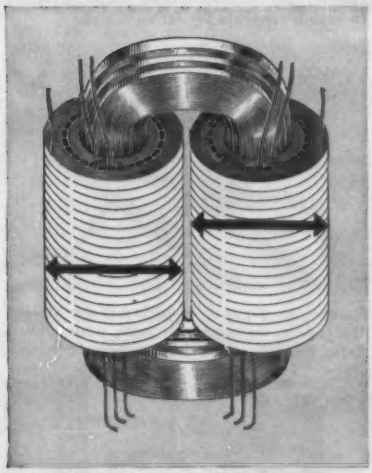


Figure 2. Round-Wound Design

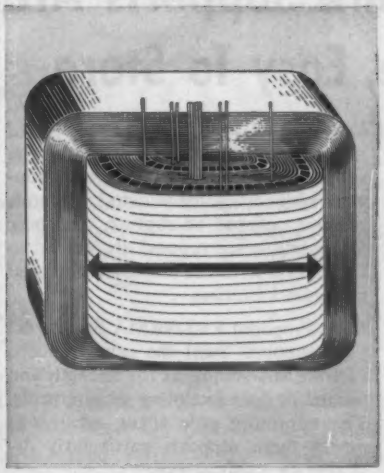


Figure 3. Shell-Type Design

Compare the difference in mean-turn diameter. L-M's Round-Wound design with the long round coils has a lower mean-turn diameter than a shell-type design. This contributes to L-M's low losses, which in turn result in good regulation, greater revenue at all power factors.

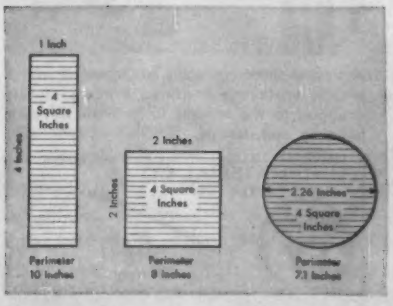


Figure 4. Compare the difference in perimeter. Each of these core cross sections has an area of 4 square inches. It takes only 7.1" of wire to make a turn around the core of round cross section typical of L-M transformers. This results in better utilization of copper, lower copper loss.

Five Reasons Why More Customers Are Selecting L-M Round-Wound Transformers

1. Higher Uniform Impulse Level: Round coils are *wound* into shape. Therefore insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.

2. Higher Short-Circuit Strength: Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.

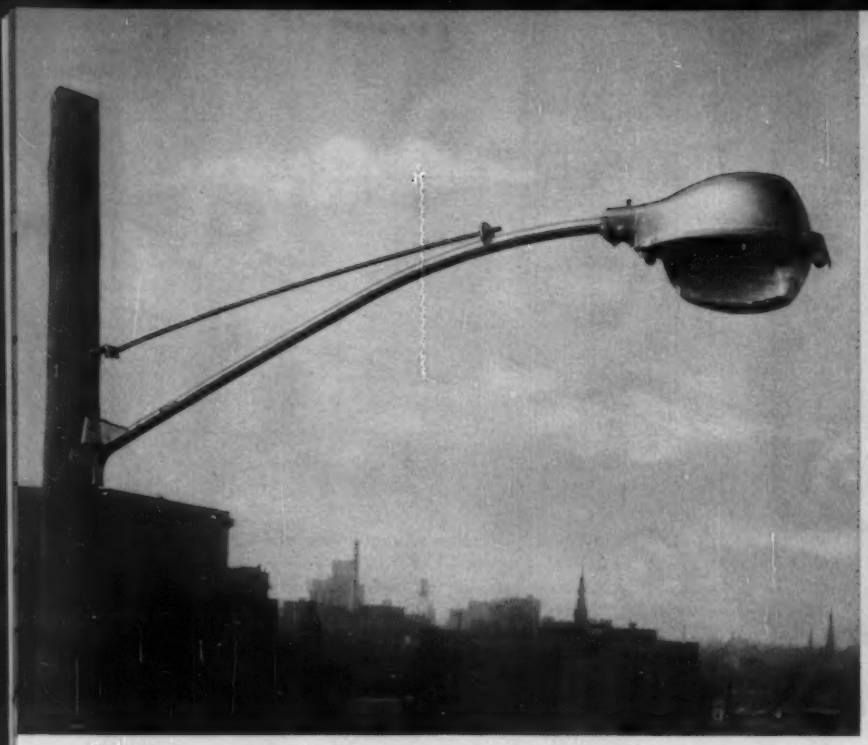
3. Higher Short-Time Overload Capacity: Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.

4. Balanced Performance: The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This results in low exciting current and core loss.

The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.

5. Additional Capacity on Pole: L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces the bending moment on the pole and crossarms, and thus greatly increases the potential capacity of existing transformer structures.

Transformers



Guy rod, pipe and parts are all firmly packaged together. Storeroom space has been reduced considerably because it is no longer necessary to have a separate bin for each part.

Why L-M Luminaire Supports Are Easy To Handle, Easy To Store

L-M's complete line of steel or aluminum luminaire supports is shipped packaged, with guy rod, pipe and parts firmly strapped together. All threaded parts of each support are protected with a plastic coating. The pole fitting and brace support are welded to the bracket, which reduces the number of parts.

How Packaging Saves Time and Storeroom Space

Because all parts for L-M's luminaire support are packaged together, they can be stored as a unit, eliminating separate bins for each part. Parts are not lost in shipment or in the storeroom when packaged together. The correct components will always be sent to the job site.

L-M's luminaire supports are designed for—

Appearance: L-M provides four harmonizing styles of supports so that several types can be used in the same installation, if desired. The supports are "upsweep" in design to give a handsome appearance.

Strength: Completely wind-tunnel-tested, L-M's luminaire supports are designed to withstand winds up to 150 M.P.H., to assure generous lateral strength. The supports can also withstand heavy non-sustaining vertical loads up to 250 pounds without collapse or rupture. The pole fitting and brace support are welded to the bracket to insure ample strength and minimize vibration.

Meet Proposed EEI-NEMA Standards: L-M supports meet the new proposed EEI-NEMA standards for strength and minimum pole mounting requirements. The minimum pole space advantage makes these supports particularly desirable for joint-use poles.

Complete Line of Luminaires and Supports

L-M supports are available in lengths up to 20 feet, in steel or aluminum. L-M also offers a full line of street lighting luminaires—incandescent, mercury vapor, and fluorescent—and complete street lighting application engineering service. Ask the L-M Field Engineer for information and bulletins. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

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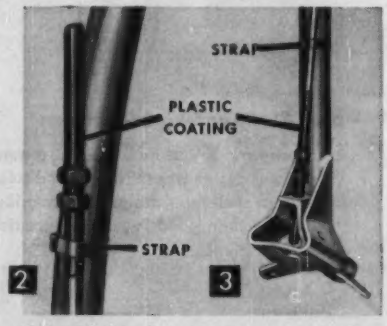
Support for guy rods is welded to the bracket. This reduces the number of parts, adds strength to the bracket, and minimizes vibration.



Nuts and threaded parts are covered with a plastic protective coating. Brace is firmly strapped to the bracket to facilitate shipping, handling, and storage.

4 Each L-M luminaire support is identified with an easy-to-read label which lists the catalog number and illustrates the mounting, length, and rise dimensions.

When ordering lighting equipment, protect yourself. Insist on quality products that meet the exacting requirements of EEI-NEMA standards (Edison Electric Institute and National Electrical Manufacturers Association).

LM®

LINE MATERIAL

McGRAW-EDISON COMPANY

Street Lighting

EDITORIALS

Sampling Reduces Meter Testing

Virginia Electric & Power Co has taken the lead in applying a new concept to meter testing as was reported in the May 6 issue of Electrical World.

The new concept involves the use of a sampling technique in place of the routine testing of all meters. Annual accuracy tests are given to a one percent sample of single-phase watthour meters in residential service. Resulting accuracy data are used to select meters which because of age, type, or severe service conditions are most often found outside the allowable range of error.

In perfecting the method the Virginia utility has demonstrated mathematically that its carefully selected sample is representative and will, in fact, pinpoint those meters that need testing. In doing so it has proved a fact long well known to metermen, that modern watthour meters hold their accuracy within close tolerances for many years. To test them repeatedly is pointless and wasteful.

It is to the credit of the Public Utility Commissions in Virginia, West Virginia, and North Carolina that they have recognized the essential logic behind the new procedure and that they have authorized the Virginia Electric & Power Co to put it into use without delay.

It is to be hoped that other state commissions will find this approach equally sound and that utilities not only in the Virginias and Carolinas but elsewhere will be permitted to use this sampling procedure to direct their testing activities on meters that need it.

Such a step as this is significant and long overdue. If it proves as successful as it promises to be, the method should eliminate much of the expense involved in adhering to presently prescribed procedures.

[*Details of the method will be presented in an article to appear in an early issue—Editor*]

A Challenge That Must Be Shared

"By its very nature the electrical industry is one which the public assumes will always be ready. Housing developments are opened with gas only promised. Householders will drill wells and use septic tanks, waiting for water and sewer. But can you imagine new home owners patiently using Coleman lamps, gasoline-powered washers, and alcohol irons till the electric utility gets around to providing service? No sir! The electricity had better be there —or no housing development . . . Other services may be compromised, but never electricity. Well, we wanted people to depend on electricity—and they do!

"Now the question is—Will the electric utility industry accept its assigned responsibility to be ready at every single stage of the great growth period that lies ahead?"

Thus the challenge of the times was put to the industry by R. S. Stevenson, president of Allis-Chalmers Manufacturing Co at the recent Southwest Electric Conference.

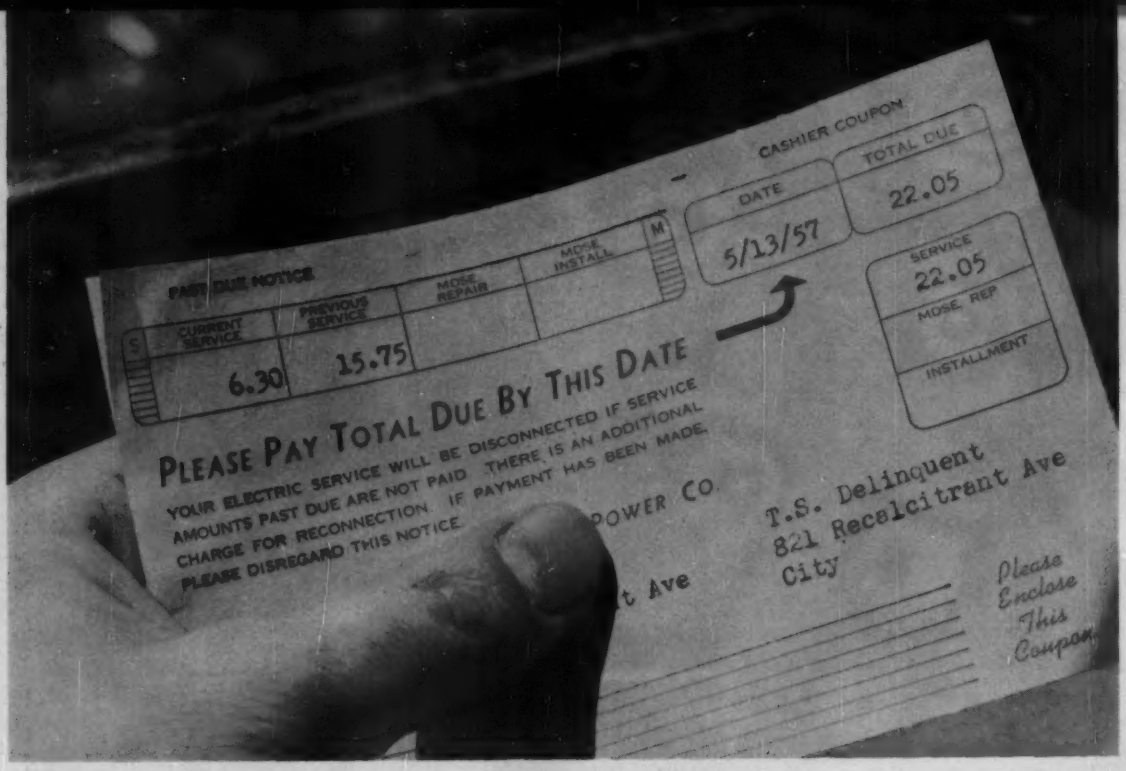
Stevenson let no doubt remain of his confidence that the industry both can and will be ready to meet in full the responsibilities of growth. He was properly forthright and emphatic in showing that utility expansion poses as big a problem to equipment makers as it does to those who produce, distribute, and sell power. The essence of that problem lies in the need for closer coordination between utility and manufacturer in the scheduling of major equipment purchases.

The manufacturer must be ready for you, and you must be ready for your customer. But the manufacturer does have a scheduling problem. The utility industry has lately been conscious of this and has made committments for major apparatus in a way that allows for orderly manufacturing processes.

But this has not always been the case. There was, as Stevenson observed, "a little hesitancy" in placing orders for heavy equipment back in 1953 and 1954. As a result, gross margins of the electric power industry were down to 14.4 percent in 1956 and at 13.3 percent in 1957 will be lower than the industry would like to have it.

Stevenson's point is well taken. The simplicity of his plea cannot be stated more clearly than in the words he used.

"I know I can speak for all the equipment manufacturers when I say that we would like to know your plans just as early as possible so that we can work with you on the type of schedule you will need to fulfill your obligations . . . The equipment industry would like to serve you well, and you can help us help you in that way."



Credit Managers Tighten the Screws

Slow payments bring firmer collection practices and higher deposits to pare mounting charge-off losses of utilities

"Look," the excited customer told the president of the utility company, "two of your fellows are out here to cut off my electric service." He admitted he'd overlooked paying his bill, but "my wife and I are having a dinner party and it'll be terribly embarrassing if our service is cut off. Won't you please ask them not to, and I'll come in the first thing Monday morning and pay the bill."

The president agreed and hung up the phone. On Monday he followed up to see if the bill had been paid. It hadn't. A week later the executive got this report: "The customer has moved away and left no forwarding address. Before he left he took a hammer and smashed the meter."

The floaters who depart without settling bills—smashed meters or not—are one of the big problems facing credit managers today, according to reports from Electrical World editors and correspondents in scattered U.S. cities. To help halt losses from these nomadic moves, utilities are increasing or reinstating security deposits to cover poor credit risks.

This is one of the major trends highlighted at the National Conference of Electric and Gas Utility Accountants in Washington, D. C., last month. As reported by T. C. Eickmeyer, Dayton Power & Light Co., the number of security deposits last year increased 5.7% for reporting electric utilities and 8.3% for combination companies over 1955. Eickmeyer, Project chairman for Edison Electric Institute's part in surveying "The Credit Picture," said five areas showed increases in number of deposits, the highest being 14.8% in the East North Central region. The Pacific area showed a drop of 10%.

Deposits Climb Sharply

Dollar-wise, deposits are up 6.9% for electric and 10.3% for combination utilities. "The industry is not after a large number of deposits but is seeking only adequate coverage where and when they feel such coverage is necessary," Eickmeyer told the national conference.

For one good-sized company contacted by EW, $99,000 was paid in 1955 for such deposits. Last year a "tightening up" move raised the total to $192,000. A Rocky Mountain company increased deposits for all commercial accounts six months ago. The boost was generally enough to cover an average three-month bill. Now the company is considering more revisions.

In the Pacific Northwest another utility is increasing security deposit requirements by one third. Ten dollars or more, depending on the load, is the amount reinstated recently by a utility in the South.

A company in the Southwest has a $10 tab for residential customers. Exempted from this are home owners, military personnel at a nearby air force base, and persons employed at a reputable firm one year or more. For commercial accounts, those with questionable credit standing ante up the equivalent of 45 day's service. The worst risks: Cafes, beer taverns, service stations, and groceries. Says the credit manager: "We've had beer joints change hands as often as 12 times in one year."

When migratory customers leave for parts unknown electric utilities

usually shift the account into charge-off column from 90 to 111 days later, unless some payment is anticipated. Unlike some of the communication companies, utilities don't exchange credit ratings on floaters. But some of them are turning charged-off accounts over to collection agencies. "So maybe the collection outfit can't pick up many," says one credit manager. "Anything they do collect is gravy—even when they charge 30% of the bill."

One Illinois division manager is sticking by a local collection firm. "He charges more but gets a higher percentage."

Installment Debt Hurts

Another headache for the credit man is reflected in soaring installment debt. Says one company treasurer: Customers have too many commitments. They don't want to ignore a bill that would cost them their new TV set; so they leave the utility bill unpaid instead.

But this group of customers is finding fewer sympathetic ears at some of the companies EW contacted. More than half showed upturns in the number of non-payment disconnects. One large company cut off 15,434 last year compared with 10,183 in 1955. Another company reported a 51.8% rise in non-payment disconnects while net-dollar charge-offs declined 16.7%.

Nationally, non-payment disconnections are up 5.7% for electric and 4% for combination companies, Dayton P&L's Eickmeyer said. And the number of disconnect notices decreased 3.6% for electric and 1.6% for combination utilities.

Yet some companies find discretion is the better part of the operating expense ledger in regards to shut offs. Item:

It was a cold, wintry night when the troublemen cut a slow-paying customer's service. The furnace blower stopped. By morning the water pipes had burst. After the homeowner's court suit had been settled, the utility began easing up a bit on its disconnect policy.

It sent out just as many cut-off notices but the number of non-payment disconnects decreased 50%. Result: Net charge-off in dollars jumped 18% last year; net charge-off in cents per customer climbed 16%.

"Sure," said a credit manager on hearing the above. "In this business your damned if you do and damned if you don't."

Still the "closer collection policy," as one credit and collections man put it, appears to be favored, despite risk of customer opprobrium.

A company in the South discloses that firmer practices are paying off. Its divisions are sending more disconnect notices after taking into consideration paying habits of the customer, the area in which he lives, and the amount due.

And the company's collection men are getting more dollars. Each division now has a collection agent rather than one agent for the system. The division men know their areas better and can handle balky or forgetful customers in the style to which they'll eventually have to become accustomed. These moves are credited for a 11.3% drop in net charge-off in dollars and nearly a 15% decrease in the cents-per-customer index.

Bi-Monthly Bills No Problem

Bi-monthly billing advantages were also mentioned by New England utility credit men. One system that recently installed it says it is apparently going to work out well. Another large company has used it for two years.

Other practices that are aiding credit departments include more telephone follow-ups before disconnecting. One company that doesn't send notices says it has cut non-payment disconnects by one-fourth with more careful screening of potential cut-offs and contacts by 'phone before the service is disconnected. A West Coast company is performing more follow-ups by telephone instead of using field collectors. It also has lengthened the period before follow-ups start.

Selectivity in sending disconnect and reminder notices cuts mailing costs and aids customer relations for several utilities contacted. By foregoing notices for customers who are generally prompt in paying, one utility shaved the number of cut-off warnings by 11%. A company in the Southwest lowered postal expense by adopting a $10 minimum for delinquent notice send-outs.

Electronic data processing promises to provide savings and more effective record keeping. For one large company now undergoing a gradual electronic changeover here's how the credit codes and customer contacts will be set up:

N—Normal domestic and good commercial - industrial - agricultural (CIA). Follow-ups start with these customers when they are two months in arrears with a balance of $15.

Q—Hazardous domestic and questionable CIA. This group gets action when one month in arrears with a balance of $15.

D—CIA's with known poor credit standing. These customers get shut-off notice with no reminder if balance is $20 or more.

S—Special customers who should not receive regular credit follow-up.

Here Are 2 Collection Techniques

For a Mountain States utility with 25,000 customers, a stepped-up mailing schedule is helping improve dragging collections. The new method finds delinquent reminders mailed ten days after the due date of the second month. This note has a specified date—usually ten days later but variable because of Sundays and holidays—threatening a disconnect unless payment comes in by then. If it doesn't, a final warning notifies the customer of service shut off after five days.

Georgia Power Co is introducing a new form for delinquent customers. It contains the same charges as the regular bill but consists of three parts: Disconnection notice; reminder notice, and collector's copy. (The reminder was not used previously.) The new form will be sent to divisions where the regular bill is mailed, and later where the decision is made on whether to send the reminder notice, or disconnect notice.

EW put this question to credit managers: "What is your most troublesome type of customer?"

The floater and low-income groups pose most of the problems, they replied. Other slow payers are in occupations—farming, lumber, textiles, and housing, for instance—in a belt-tightening stage.

"Regulars"—those who don't pay until the last minute after "final" notice—caught the ire of one credit man. Another company's nemesis is among customers with the meter inside the house—and 55% are. One manager summed it up: "The most troublesome one is the one who doesn't pay."

REA Girds to Meet Farm Demand Hike

Growing use of electricity on today's farms shown in sharp surge in REA's 1957 loan requirements

Phase of bringing in initial power draws to close; era of all-electric farm near

When the Rural Electrification Administration last month virtually doubled its available 1957 electrification loan funds with a $200-million deficiency appropriation from Congress, it was girding to help meet a surge of demand for more power from the nation's farms.

The growing need for more power on today's farms reflects a number of circumstances. As REA Administrator David A. Hamil says, "We have just found out how to use electricity on the farm for household purposes and also production purposes out around the place."

Farms Go All Electric

The farmers, through their co-ops, have completed the phase of bringing in power. Today they are putting it to work in ever increasing amounts to compensate for labor shortages, to permit greater production and greater efficiency, and to cut costs. The farm is going all electric.

REA originally had estimated 1957 loan requirements at $185 million. With the carryover from 1956 this made available $240 million.

In the fall of 1956 loan applications from co-ops showed a sharp increase. REA then revised its estimate of total loan requirements for the year ending June 30 upward to $363 million.

With the latest deficiency appropriation, the Administration now has available $440 million, part of which will be carried over to 1958.

REA Loans $¼ Billion

As of March 31, REA had approved loan applications totaling $255 million.

A breakdown of the use to which this money is being put in 1957 reflects the growing demand for power. Hamil points out that most co-op borrowers built a substantial part of their distribution systems during the 1949-51 period. "They have exhausted the capability which was built into these systems and must now step up construction to stay ahead of continuously expanding demand for power," he says.

In calendar 1956, power requirements of all REA borrowers increased 15% compared to an industry-wide increase of about 10%.

Of the $255 million approved by the end of March, $64 million, or 25% will go for generating facilities. During the period 1935-56, generating facilities took only 9% of all co-op loans funds.

In the 1957 loans, transmission accounts for $39 million, or 15%, against 10% in the 1935-56 period. Distribution and system improvements expenditures during the 1935-56 period accounted for 79% of funds, while in 1957 this has dropped to 58%, or $145 million.

Farmer Spends $4, Co-op $1

Another indication of the growing use of electricity on the farm comes from a sample study made by REA in 10 random states.

This shows that in 1957 co-ops have invested an average of $2,572 per farm in wiring, electrical appliances, farm and plumbing equipment, against $1,836 in 1952. These figures show an expenditure of $4.04 for wiring, appliances, and equipment per $1 of investment by the co-op in electric distribution facilities, compared with $3.37 in 1952.

During this same period, farm average kwhr usage of electricity went up 46%.

This increased usage of electricity points up another need for today's co-ops. This is to heavy up distribution systems to carry increased loads. Many systems are converting from single to three-phase distribution.

Electrification Loan Funds

Year	New Authorizations (millions)	Total Available, Including Carryovers (millions)
1948....	$400	$413.1
1949....	400	494.4
1950....	500	546.2
1951....	303.6	443.7
1952....	175	358.1
1953....	100	244.9
1954....	180	221.1
1955....	170	220.3
1956....	260	317.4
1957....	414*	440.3

*Includes $200 million supplementary authorization of April 16, 1957.

Load Growth Expected for Nation's Farms: Average Customer Use—Kwhr per month

Year	Actual	Geometric	Estimated Median	Arithmetic
1948..	121	...	...	...
1952..	184	...	...	...
1956..	269	...	...	...
1960..	...	400	380	340
1964..	...	600	510	410
1968..	...	900	660	490

At the same time, the job of connecting up new customers is by no means finished. In 1957, REA estimated 25,000 miles of distribution line will be energized, bringing service to an estimated 100,000 new customers. About 3,000 miles of transmission line will be energized, and 158,000 kw of new generating capacity will be installed.

As the emphasis in rural electrification has swung away from making initial electric installations to meeting the demands from connected customers, REA officials are encouraging greater attention among co-ops to long-range system and financial planning.

At the meeting last month with its advisory group, REA worked out the final outlines of proposed guidelines for long-range planning for co-ops. The recommendations will be issued shortly in an REA policy bulletin titled "Planning for Business Security." Background work on these policies has been going on for many months.

Chamber of Commerce Statement Urges Private Development of Atom

Strong opposition against the federal government's entry into atomic electric energy generation was voiced by the Chamber of Commerce of the United States in a policy declaration at its recent 45th annual meeting. Following is the text in full:

"The United States' world leadership in developing atomic power for the benefit of mankind should be measured in terms of broad and varied technological progress and application rather than installed atomic electric generating capability. Measured in such terms, our program should be, and is being, broadened as technological advances permit. As the program progresses and is broadened, the following principles should be followed:

"Promising types of experimental atomic reactors should be constructed, owned, and operated by the utility industry as rapidly as is consistent with technological development of the art. The federal government should not enter into the commercial exploitation of the use of atomic energy. During the developmental phase where private industry is either unable or unwilling to undertake the construction of experimental or developmental facilities deemed necessary on the basis of a full consideration of all national interests, the federal government could contribute to the cost of such research and development and to the cost of construction and physical installation of such purely research and developmental facilities; and could offer assistance to atomic fuel and reprocessing industries, and waiver or reduction of charges for use, rental, or burn-up of fuels.

"A commercial plant, licensed under Section 103 of the Act, should be financed and built by the utility industry without federal financial assistance in any form in the construction or operation thereof.

"Information as to the full amount of federal financial assistance in the construction and operation of all experimental facilities under this program should be made public whenever this can be done without endangering the national security.

"The production for sale to the public of electric power from nuclear materials should be the responsibility of the existing utility industry. Any electric power available at existing AEC atomic installations should either be used by AEC itself for such installation or disposed of on a non-exclusive basis to distributing utilities in the area without preference or discrimination."

House Unit Probes Validity of Trinity River Dam Data

The partnership proposal for development of the Trinity River project in California appeared headed for a setback last week. Interior Secretary Fred A. Seaton asked the House Interior Committee to hold up action on a partnership bill because some of the original data seemed to be in error.

Committee Chairman Rep Clair Engle of Calif. promptly questioned the validity of the other supporting data Seaton had furnished for the plan.

Seaton first recommended partnership between Bureau of Reclamation and Pacific Gas & Electric Co to the President and Congress Feb. 12. The plan would provide for PG&E to buy falling water from the $225-million Trinity Dam, install and operate the 384,000-kw generating facilities for 50 years, and pay the government $4.6 million a year.

This arrangement, said Seaton, would mean a surplus of $165 million in project revenues over the 50 years as compared with all-federal operation.

Committee Wants Backup

A few weeks ago the committee asked Seaton for backup data on the various figures he used to bolster his argument on the desirability of partnership.

In particular, the committee questio ed Seaton's figure of $86 million as the increased cost of power to preference customers from the partnership plan as against the federal plan over the 50 years. The committee contended their calculations showed the figure should be closer to $200 million.

In response Seaton has now told the committee that "certain data" furnished him by Reclamation's regional director "appears to be in error."

If Seaton's report discloses an error in the $86-million figure, the committee undoubtedly will ask for re-examination of all other data. They also are questioning the figure of $135 millio.ı that Seaton says would be paid in local, state, and federal taxes over the 50 years.

SRE Hits "Critical" List

First sustained chain reaction for sodium-cooled "thermal" reactor gained by North American Aviation

Power level of the Sodium Reactor Experiment (SRE) is being increased gradually after successful self-sustaining nuclear fission was achieved late last month near Los Angeles. SRE is the first sodium-cooled "thermal" reactor to produce a sustained nuclear reaction.

Said the Atomic Energy Commission: "During the initial start-up test the reactor operated at a power level of about 1 kw of heat. No electricity was generated. The design capacity of the SRE is 20,000 kw of heat."

Neutrons moderated with graphite sustains the fission process in the SRE. Liquid sodium circulated through the reactor core removes heat produced by atomic fission.

Cost estimates have nearly doubled since the project was announced three years ago. Then the figure was $10 million including research and development costs. The estimate now is $19.1 million. This includes $6.8 million for fabricating the reactor, $12 million for research and development, $920,000 for the building, and $230,000 for fuel element fabrication.

So. Cal. Ed to Buy Heat

After completion of experimental tests to determine nuclear characteristics of the reactor, Southern California Edison Co will purchase heat to generate about 6,500 kw on an experimental basis.

The small-scale experimental civilian power project is being developed for the Atomic Energy Commission by Atomics International, a division of North American Aviation, Inc.

The SRE went critical April 25. It is the second reactor to do so under AEC's five-year reactor development program. The first was Argonne National Laboratory's Experimental Boiling Water Reactor which went critical last December. Two other reactors—Shippingport Pressurized Water Reactor and the Oak Ridge Homogenous Reactor Experiment No. 2—are expected to be operating later this year.

Comparison of Several Homogeneous Reactor Types

Type	Fuel	Basic Cycle	Comments
Simple Burner	Highly enriched U-235, as solution of uranyl sulfate	Straight burning of U-235	Relatively low plant cost but high fuel cost, making the total energy cost non-competitive
Heavy Solution Reactor	Slightly enriched U-235 in highly concentrated uranyl sulfate solution	Straight burning of U-235 plus conversion of U-238 to plutonium. Plutonium can be burned in place or sold as by-product	Fuel cost would be less than that of the simple burner but corrosion and thermal stability problems are more severe; hence probably not technically feasible in the immediate future
Single-Region Slurry Reactor	Mixture of oxides of thorium and uranium, in same slurry form	Straight burning of U-235. Conversion of Thorium 232 to Uranium 233. U-233 can be burned in place or sold as by-product	Can produce from thorium at least as much fissionable material as it consumes; consequently has excellent possibilities for competitive power.
Two-Region Slurry Reactor	Central core of highly enriched uranyl sulfate, surrounded by blanket of thorium-oxide slurry. Two fuels separated by core liner	Straight burning of U-235 in core. Neutrons from core convert thorium to U-233; U-233 also fissions, thus producing more heat	Can produce from thorium even more fissionable material than it consumes; consequently could possibly have negative fuel costs. However, the technical problems to be solved appear much more difficult than in the case of the single-region reactor

Prepared by: W. E. Johnson and D. H. Fax—Westinghouse Electric Corp; S. C. Townsend—Pennsylvania Power & Light Co

NUCLEAR NOTES

Price-Anderson reactor indemnity bill (HR 1981 and S 715) has been reported out by the Joint Committee on Atomic Energy. Amendments, based on AEC suggestions, include formal establishment of the Reactor Safeguards Committee as a statutory body, requires its findings be made available to the public, and calls for public hearings on license applications for reactors.

Nautilus crewmen received average radiation exposure of 200 mrem (milliroentgens equivalent man) in 1956. Maximum exposure was 2,200. Permissable limits for radiation workers are now 15,000 mrem per year, as set by National Committee on Radiation Protection. Annual limit of 5,000 mrem has been recommended by the group.

New German reactor uses ball-formed fuel elements of sintered uranium carbide and graphite. Fuel elements are fed into the tower-like reactor tank from above and are removed below. Changes in filling and cooling are sufficient for control without need for control rods. The homogenous gas-cooled unit is joint effort of Krupp, Essen and Brown Boveri and CIE.

Britain has revised Hinkley Point station capacity upwards. From 400 to 450 Mw capacity is anticipated now compared with 275 Mw previously announced.

Meet Ottis Fitzwater, New IPALCO Chief

"Fitz," who rose from 11-year-old water boy to utility president at 51, advises young men: "Start young, work hard"

How does the president of a major electric utility get started up the ladder?

Easy-smiling Ottis T. Fitzwater, new president of Indianapolis Power & Light Co at 51 years of age, has a quick answer to that—start young. Few executives in America can beat his record on that score.

He recalls: "The summer I was 11 years old I'm sure my father wanted to take me out from under my mother's feet. He hauled me along when he went early of a morning to work on a new power line at the edge of town.

"I was given a bucket right away and started carrying water to the men. The foreman put me on the payroll at $2 a week within a few days. I've been in the electric utility business ever since, you might say."

"Fitz", as he's known to everybody at IPALCO, now is recognized as one of the nation's best informed executives on utility financing laws. His rise to the top may be attributed to many traits—but the two most outstanding are hard work and the fact that he's never stopped learning. Associates assert he never has been a respecter of hours for himself. He works 'till the job is done.

On Vacations — Pole Shaving

During summer vacations from PS 41 and Arsenal Technical High School, which he attended two years full time, he worked in the utility's pole yard and the garage. He shaved and creosoted poles, greased and washed company vehicles.

His first full-time job—that of timekeeper at the old Indianapolis Light & Heat Co's Kentucky Avenue plant—came in 1923, when he was 17. Meanwhile, after completing Tech at night, he began night courses with International Accountants Society and at Indiana University Extension at Indianapolis.

Starting his steady rise, Fitz was transferred to the general accounting department in 1925. After Light & Heat merged with Merchants Heat & Light in 1927 to form IPALCO, Fitz continued to broaden his knowledge and to keep moving up.

Master-Minding 8,000 Owners

It was one of the most dramatic financial events of electric utility history that brought out the Fitzwater qualities at their best. Early in 1940 the ownership of IPALCO was changed from one owner to 8,000, overnight. But back of this smoothly co-ordinated change-over were weeks and months of day-night work by Fitzwater in master-minding preparations for the nation's first large disposal of electric utility common stock to the public under the Holding Company Act of 1935. It was the industry's laboratory case.

From that time on, Fitzwater's rise was rapid. He was elected assistant treasurer in 1940, treasurer in 1945, vice president and treasurer in 1949, and a director in 1956. In addition, he was company assistant secretary from 1940 to 1949.

But Fitzwater's interests are not confined solely to his "desk job." He enjoys a neighborliness with the employees that's as comfortable as an old fishing hat. He can call just about all of the utility's 1,800 men and women by their first names.

Fitzwater, standing five feet, eight inches tall and now weighing 176 pounds (despite some efforts at dieting), has taken part in activities of company groups for years.

He recalls with a broad grin: "A good many years ago I sang baritone with the IPALCO choir for a while. But I didn't last too long. They wanted to keep the choir going."

He has received a better response from IPALCO's Young Men's Forum. This group meets regularly to discuss problems related to the utility field, with management duties in mind. Fitzwater's frequent sessions with members have been mutually beneficial.

He's strong for closer links between school and job. The alternating of classes and work away from campus for credit toward a degree has his hearty indorsement.

"I wouldn't take anything for those summers on the line gang or in the pole yard and it seems to me that young men can obtain much valuable experience through the college-industry programs," he comments. IPALCO has some of these young men on its payroll.

Top Responsibility Is Service

While recognizing the demands of technical day-to-day operations, he puts service to the public at the very top of the list for company responsibilities. He's practiced it all along, as did his father, who never failed to answer an emergency call during almost 43 years in the electric service of Indianapolis.

Married in 1927 to the former Paula Leigeber, an Indianapolis girl, they are the parents of two sons, Donald, 29, and Richard, 27. Both are married and live in Indianapolis.

Fitz, a glowing example of what initiative, ambition, and hard work can do, believes there is just as much chance as ever for young men.

"We have barely scratched the surface—in fact haven't quite done that— on electric house heating," he observes. "The use of electricity will keep going up, to at least triple its present output for households alone in 20 years. That's just an example of what we may expect. Opportunities for careers in the electric utility field were never better."

Power Failures Hit 3 Areas

- Navy plane cuts Pacific G&E 220-kv line
- New Orleans Public Service loses substation
- Potomac Electric Power distribution bus shorted

Trouble hit recently in three parts of the country, in each case producing a power failure that affected many utility customers.

Frisco: Voltage Dips and Blackout

Near San Francisco a low-flying Navy AD7 Skyraider, piloted by 26-year-old Lt Harry M. Nyberg, snapped two cables of a Pacific Gas & Electric Co 220-kv transmission line. This caused a 20-minute power failure in San Francisco and the suburban Peninsula area.

As the accompanying picture shows, Lt Nyberg escaped death in the incident which occurred while he was flying across a canyon. The Skyraider he was flying was somewhat damaged.

Aside from customers blacked out by the power failure, others experienced voltage dips in San Francisco and the Peninsula area, and power was off in some suburban areas.

The break occurred in 61-strand all-aluminum cables straddling Niles Canyon in the East Bay area. The repair job required approximately four days because the entire length of the two cables had to be replaced. Spliced cables would not be strong enough to span the 2,400-ft-wide canyon, the company said.

At the time the line was snapped, it was feeding 330,000 kw into San Mateo, of which 230,000 kw was going to San Francisco.

Immediately four 60-kv lines coming out of San Mateo substation were dropped, enabling voltage to be restored. Then power going into San Mateo was rerouted over 110-kv lines out of Newark. Balance of the load was picked up, allowing the 60 kv's to get back into service.

The San Francisco situation was aggravated by the fact that surge following the voltage drop knocked out auxiliary motors of Potrero steam plant, San Francisco, so the 25,000-kw load it had been carrying (one of its units was being repaired) had to be made up elsewhere.

The Hunters Power steam plant in San Francisco, which had been carrying 135,000 kw, was boosted to 262,000 kw, its rated capacity, and for a short time it was pushed to 270,000 kw.

New Orleans: 2-Hour Paralysis

In Louisiana, a power failure partly paralyzed New Orleans for almost two hours Sunday afternoon April 28 when a New Orleans Public Service, Inc, substation failed. The Claiborne station at Elysian Field, upon failing, threw an overload on other circuits throughout the city, causing them to open.

Service was not fully restored until about two hours later. Louisiana Power & Light Co service was interrupted for about 15 minutes in the Algiers-Gretna area and momentarily in Arabi due to the overload passing through emergency lines connecting NOPSI and Louisiana P&L.

Most hospitals continued their activities with auxiliary units. The Southern Bell Telephone Co, which operates on batteries charged with commercial power, prepared to put auxiliary equipment into use, but the breakdown ended before telephone service was impaired.

NOPSI issued the following statement:

"The initial cause of trouble was the accidental opening of a disconnect switch on a main 115,000-volt tie line between Market Street generating station and Michond station. The switch is located at Claiborne substation.

"The accidental opening of the switch caused a flashover of an insulator. Heavy short circuit currents followed as a result.

"Protective devices which normally isolate such faults from the rest of the system, it is believed, did not operate properly. This resulted in a sustained low voltage condition which caused generation at PS power plants to be disconnected automatically from the electrical system along with the high voltage interconnections with Louisiana P&L".

Washington: Spotted Outages

Segments of Washington, D. C., were without power for one hour and 45 minutes May 2 when, due to an operator's error, Potomac Electric Power Co suffered a power failure on part of its system.

The error occurred when an operator by mistake pulled a disconnect switch at a 13-kv bus causing a short circuit in a 4-kv distribution system. The failure cut off power to a number of large apartment buildings on Massachusetts Ave, to a Naval communications school, to the WTOP television studios, and to two large department stores in the area. The power went off at 3:37 PM and was restored by 5:20 PM.

Engineers Go Back to School for More 'Tools'

Advanced courses, aimed at men with 5 to 10 years' experience, to help provide answers to tough operating problems

An advanced course in electric utility engineering geared to the needs of power system engineers was recently inaugurated by Westinghouse Electric Corp. The three-months' course, taught by Westinghouse's utility specialists, is being offered to assist electric power companies to give their young engineers the mathematical and engineering tools needed for analysis of power-system problems.

Participants in the course are operating utility engineers with five to ten years' practical experience. This was considered an ideal time for them to undertake work at the graduate school level because they are able to build on a number of years of practical experience. Sixteen engineers are participating in the course, which started Feb. 18. Under present plans the course will be run once yearly during the spring.

The program is divided into three parts:

1. Fundamental course at the graduate level (see box).
2. Lectures on special topics.
3. Laboratory and factory demonstrations.

There are twelve two-hour formal lectures in each of the fundamental courses. Each lecture is followed by a problem session also two hours in duration. Classes are held from 8:30 AM to 5:00 PM. The school has all the attributes of a university graduate course plus the practical aspects of the special lectures and laboratory.

Twenty special lectures will be given by specialists in the field under discussion. Topics will include power generation and dispatch, calculators and computers, transmission and distribution, residential, commercial, and industrial power supply, load characteristics, and application of capacitors and protective devices.

Practical aspects will be emphasized in the laboratory and factory trips. They will not be mere inspection trips, but rather actual demonstrations of equipment whenever possible. Machine and power plant designers will be present to assist in the demonstrations and explanations of significant features of the equipment.

In addition to trips to Westinghouse manufacturing facilities, several utility properties will be visited. All tours, with exception of a trip to the Steam Division in Philadelphia, Pa., will be in and around the Pittsburgh area.

Here's What They're Learning . . .

Symmetrical Components

Representation of unbalanced vectors by symmetrical components. Application to solution of unbalanced system conditions involving line, transformers, and totaling machines.

Transients in Linear Systems

Development of differential equations governing the transient behavior of linear mechanical and electrical systems. Solution of equations by Laplace transformation, and physical interpretations.

Power System Analysis—I. Steady State

Electrical characteristics of lines, transformers, and machines and their effect on steady-state performance of power systems. Regulation, circle diagrams, capacitor application, network solutions.

Lightning Protection of Power Systems

Lightning phenomena and theory of traveling waves on transmission lines. Design of transmission lines with regard to lightning, insulation coordination, and application of lightning arresters.

Power System Analysis—II. Transients

Performance of power systems during abnormal conditions. Transient stability, system overvoltages and grounding, switching surges, breaker application.

Protective Relaying

Modern relay practices for the protection of generating stations, substations, and transmission lines. Overcurrent relaying, differential schemes, distance relaying, carrier and microwave. Special purpose relays sensitive to frequency, negative and zero-sequence quantities, and transformer gas pressure.

Selective Meter Testing

Public Service Commissions in the states of Virginia and North Carolina have authorized Virginia Electric & Power Co to use a new selective sampling method for routine testing of single-phase meters. Details of the plan were disclosed to members of the EEI-AEIC Meter and Service Committees at St. Petersburg, Fla., late last month.

Under the new method, VEPCO uses results of annual tests on a 1% sample of its meters to guide selection of types, makes, and ages of meters for concentrated testing. W. C. Harrison, system meter supervisor of VEPCO, told the meter men that the plan permits the company to concentrate its testing activities on meter types which the sample shows are most frequently outside the allowable error permissible due to age, type, or location in corrosion or other severe service areas.

Although the exact percentage of total meters in the sample is not specified by commissions, VEPCO is selecting every hundredth meter in its file of billing stencils. The Virginia company formerly tested the 835,000 single-phase meters on its system every eight years, using a group-removal system.

Water Outlook Poor

California's water supply outlook appears to be poor, according to the latest forecast by the state's Water Resources Dept. Based on April 1 conditions of precipitation, reservoir storage, and ground water conditions, the runoff will continue to fall below average even if precipitation for the rest of the year is normal, the forecast said.

Not a Brief . . .

The longest record ever filed in the Iowa Supreme Court has been entered in the case of Iowa-Illinois Gas & Electric Co *vs.* the City of Fort Dodge. The litigants are appealing a rate case in which the city attempted, by ordinance, to prevent the utility from increasing its rates. The record and exhibits cover 1,139 pages in three volumes. Cost: $7,431.

Track of a Tornado

One of the most accurate records ever made of the speed of a tornado has been taken from records of Dallas Power & Light Co and given to researchers studying tornadoes at Texas A&M College.

Data recorded at the DP&L dispatch office shows the time that the April 9 Dallas tornado tore through each of 12 feeder lines.

Stuart Bigler of the Dept of Oceanography and Meteorology says the records are the most accurate he knows of that show a tornado's progress from point to point.

Other records have been made from electric clocks that stopped due to disruption of service by tornadoes but such information was taken from separate clocks. In the case of the DP&L information, the times were kept on one clock.

According to the DP&L information, the tornado traveled about 30 mph in its trip across Dallas. The first feeder line was broken at 4:37 PM and the last at 4:56 PM. The DP&L record covered 8½ miles of the tornado's trip across Dallas. Estimated damage to the city was $4 million. DP&L estimated damage to its facilities at about $58,000.

Cleaner Air, More Rain

Polluted air may be much more reluctant to yield rain than clean air, according to studies conducted at Hitchcock, Texas, by Dr Ross Gunn, the U. S. Weather Bureau's director of physical research. Dr Gunn recently told the National Academy of Sciences in Washington, D. C., that his studies indicated industrial ash and other matter dumped into the air seems to cut down the likelihood that raindroplets will become big and heavy enough to fall.

99-Year Contract

Having bought 145 acres from the Public Service Board for a new steam station, El Paso Electric Co is now negotiating a 99-year contract with PSB and the city for a supply of water. The Board retained water rights to the land. The agreement will provide for a review of water prices every 15 years, it was reported. PSB will supply an initial 200 gpm, but consumption will jump to 1,200 gpm when the first 80-Mw generator goes into operation.

Concentrating on the Sun

A solar energy center has been proposed at Tierra de Sol, 63 miles east of San Diego. It is to be used in research and development work, and possibly for manufacturing at a later date. To be owned by a group of eastern businessmen, the center will study solar applications to house heating, power production, and experimental extraction of fresh water from sea water.

The location is a townsite owned by J. Y. Leveque, a management consultant who is sponsoring the project. Formerly the site was known as Hipass. It is 3,800 ft above sea level, and has a clear atmosphere, both factors ideal for solar studies.

Cost of the original plant has been set at $250,000, but installation of a solar furnace for generating temperatures of 6,000F will be additional.

Protective Scheme Cuts Costs

Omits 4 of 6 bushing potential devices from 115-kv line with substation, Illinois Tech Relay Conference is told

Four of the six bushing potential devices can be omitted from the protective scheme of a 115-kv line in which a substation has been inserted, the Illinois Institute of Technology's Relay Conference was told April 25-26 at Chicago.

Ruben Zimmering, Northern States Power Co, described this economical scheme which, he said, has given good service. It employs only phase-comparison carrier current relays at the inserted substation and phase-comparison carrier current, along with line-impedance and directional-overcurrent ground relays for backup, at the remote end of each line. The system, he said, contrasts with the usual full complement of line and ground carrier current and line and ground back-up relaying at both ends.

Voltage relays at small-capacity tap substations and carrier relaying at the line terminals eliminate flashover on lines 115-kv and above, said J. E. Skuderna, U. S. Bureau of Reclamation. Cause of the flashover, he said, is the current fed into the transmission lines by rotating machines on circuits out of the substation. He noted that special relaying is applied only where experience demonstrates a need for it. So far, such need has been indicated only for about 10% of the tap substations.

New Phase Relay Described

T. G. Brennan, General Electric Co, described a new type phase relay for the protection of subtransmission lines. It is a two-step, directional-distance overcurrent relay which provides accurate selective protection, he said. Designed specifically for subtransmission line application, it uses the mho element. The two-step reach is provided by a switching mho element.

L. C. LaTourette, Pioneer Service & Engineering Co, described a scheme designed to permit automatic check back of relaying carrier sets where there is no operator at either substation terminal of a line. The scheme has a master check unit with two synchronous, motor-driven timers and four or five telephone type relays. Operated from the dispatcher's office, it has performed well. Three installations have been made on the Northern States Power Co system and others are planned.

Thomas Niesink, Commonwealth Associates Inc, described a bus protection scheme using linear couplers instead of current transformers. The scheme is used for double bus protection. One linear coupler protects both buses by using a fault-detection relay on the bus-tie breaker to determine which bus is faulted. Voltage-fault detectors on each bus replace fault-detecting relays on the bus-tie breaker when it is bypassed. The linear coupler is not as difficult to switch as current transformers.

Westinghouse Electric Corp has investigated the performance of transistors installed in place of vacuum tubes in carrier current equipment, said John Becker. In 48 transistors installed, some as long as three years, performance has been watched carefully. Indications are that they will have much longer life than tubes.

G. J. Marieni, Westinghouse Electric Corp, described measures to produce a complete, new, and improved line of relays. The new flexitest case was designed to improve the dust seal, the short circuiting switches and to enclose some auxiliaries. The overall relay design has improved operating characteristics, lowered the burden, improved mechanical construction, provided greater reliability, and simplified maintenance, said Marieni.

PEA Told of Ultrasonic Meter Cleaning

Ultrasonic cleaning of cumulative demand registers will probably save the Long Island Lighting Co $11,000 annually in labor costs. J. W. Dye revealed this potential asset of applying ultrasonics to the meter business at the spring meeting of the Pennsylvania Electric Association Meter Committee at Garden City, N. Y., April 11-12.

He indicated that Long Island Lighting Co has been experimenting with ultrasonic cleaning since 1956. For the past two months cumulative demand registers have been cleaned by this process on a routine basis. Registers of all manufacturers seem capable of cleaning. The only difference is in precleaning procedures, which take 1 to 4 min depending on the register's make. There are three steps to the cleaning cycle:

1. Rough cleaning—the mechanism is spun in air to remove loose dirt.

2. Intermediate cleaning—submersion in a cleaning solvent to remove as much of the remaining dirt as practicable.

3. Ultrasonic cleaning—submersion in a cleaning solvent which is vibrated ultrasonically. This step takes only about 30 sec. When the mechanism is removed from the solvent it dries in a few seconds.

Dye said that the most difficult part of developing the cycle was finding a suitable solvent. He still feels that considerable work is yet to be done in this respect.

Providing an orderly means of changing two-wire to three-wire meter installations with minimum inconvenience and hazards has been made practicable on the Public Service Electric & Gas system by the use of a $15 meter-change adapter (EW, Nov. 26, 1956, p 104). H. Probst said that the change plate enables an electrician to reinstall two-wire instrument for metering after changing the house wiring to three-wire service.

J. W. Althouse Jr., Philadelphia Electric Co, described a method of tabulating "as-found" test data in a two-dimensional table. Heavy load accuracies are arranged as the abscissa and light load accuracies as ordinates. The accuracy of the meter is recorded at only one point in the table. He said this two-dimensional method gives a visual picture that can be used for an on-the-spot analysis of meter performance.

Grid in Floor Heats Warehouse

- **Expanded metal reinforcements in concrete floor heat Chicago utility structure**
- **Heating elements operate at 16 v to release 900 kw of heating**
- **Heat stored from off-peak energy keeps building warm during peak-load periods**

ROBERT E. JONELIS, Engineer, and **ROBERT C. GEYER**, Architect, Commonwealth Edison Co, Chicago, Ill.

Off-peak electric heating is being used at Commonwealth Edison Co's Ridgeland warehouse where expanded metal reinforcing grids in the concrete floor have been connected as electric heaters. Heat is stored in the 6-in. concrete floor during off-peak periods, and the warm floor heats the building when the current is turned off during peak periods.

The entire warehouse floor is used as the heater. The expanded metal grids were imbedded in the concrete 4 in. under the surface. If a more sensitive temperature control or instantaneous heating system were desired, the grids would be placed nearer the surface.

Four features of the installation may be of interest to large industrial customers:

1. Current in the expanded metal grids can be controlled to fit the industrial user's own load requirements and can thus be kept off the user's peak, adding nothing to the demand charge.

2. Output of floor heating grids can be varied by design to provide heat exactly where it is needed and in the exact quantities.

3. The entire floor area is heated, eliminating hot spots and cold spots.

4. Because of the radiant effect of the floor, occupants feel warm almost immediately after the large garage type doors are closed, even though the doors may have been open for a period of time.

All the warehouse grids operate only during the night and a portion, those at the perimeter, operate during the afternoon. The heat stored in the concrete floor slab maintains temperatures in the building within reasonable limits. The grids are basically controlled by an outside thermostat which controls slab temperature in accordance with weather changes.

Heating grids were installed and connected as shown in the illustrations. First, a two-inch layer of concrete was poured and the grids were set in place. The grids were connected in series, and bolted to leads from 480-v/16-v heating transformers.

The largest practical pouring area was 1,000 sq ft which fixed the grid assembly measurement at 30 ft by 35 ft. The exact amount of heat required can be built in by varying length and width of the grid assembly.

1 Expanded metal grid was laid in the concrete floor of Ridgeland warehouse and is used as the heating element

2 Grids were connected in series before the concrete set. Silver plating improves connections and the current flow

3 Two 750-MCM were paralleled to form secondary leads from the 16-v heating transformers to the steel grids

The warehouse is supplied by a 1,500-kva, 3-phase 34.5-kv/480-v substation. The 480-v secondaries from the substation feed underground into a distribution panel in the warehouse. Dry type, 50-kva, 480-v/16-v transformers were placed near their points of 16-v connection to the heating grids.

The 16-v supply to heating grids was chosen for safety reasons. A 32-v supply with midpoint grounded would provide equal safety; currents would be lower and installation costs less. Future jobs will probably be planned with this type of connection.

Actual heating capacity of the grid system inside the warehouse is 900 kw. There are 115 kw available for snow-melting grids in loading platforms outside.

Because office air-conditioning was required, four package air-to-air heat pumps were installed to level off the temperature valleys created by the off-peak floor heating system and to heat the ventilation air. The general office will be served by three 5-ton heat pumps, and the warehouse office will be served by one 5-ton unit.

Each heat pump will be able to supply supplementary heat at the rate of 35,000 Btu per hr even at —10F outside temperatures. Additional built-in resistance strip heaters can be used to give each unit an over-all heat output of 78,000 Btu per hr. Because of the warm floor it is not expected that operation of the strip heaters will be necessary.

FOA Cooling Proves Thrifty

SUBSTATION
Operation

Substantial economic benefits, supplemented by years of satisfactory operation, warrant prediction of continued trend to forced-oil cooling for large power transformers

LEE H. HILL, JR, Product Planning Engineer, General Electric Co, Pittsfield, Mass.

We know of no recent application requiring a power transformer 20,000 kva or larger where the basic economic evaluation did not favor forced oil over all other cooling methods. Increased current densities and smaller size obtained by the various methods of forced cooling produce transformers of lower first cost, lower excitation losses, and higher load losses. Comparison of the sums of these three major components of total cost swings the economic choice to forced oil.

The accompanying charts show this basic economic comparison for large power transformers (over 50,000 kva) and intermediate power transformers (20,000 to 50,000 kva) rated 115 or 138 kv with 550 BIL.

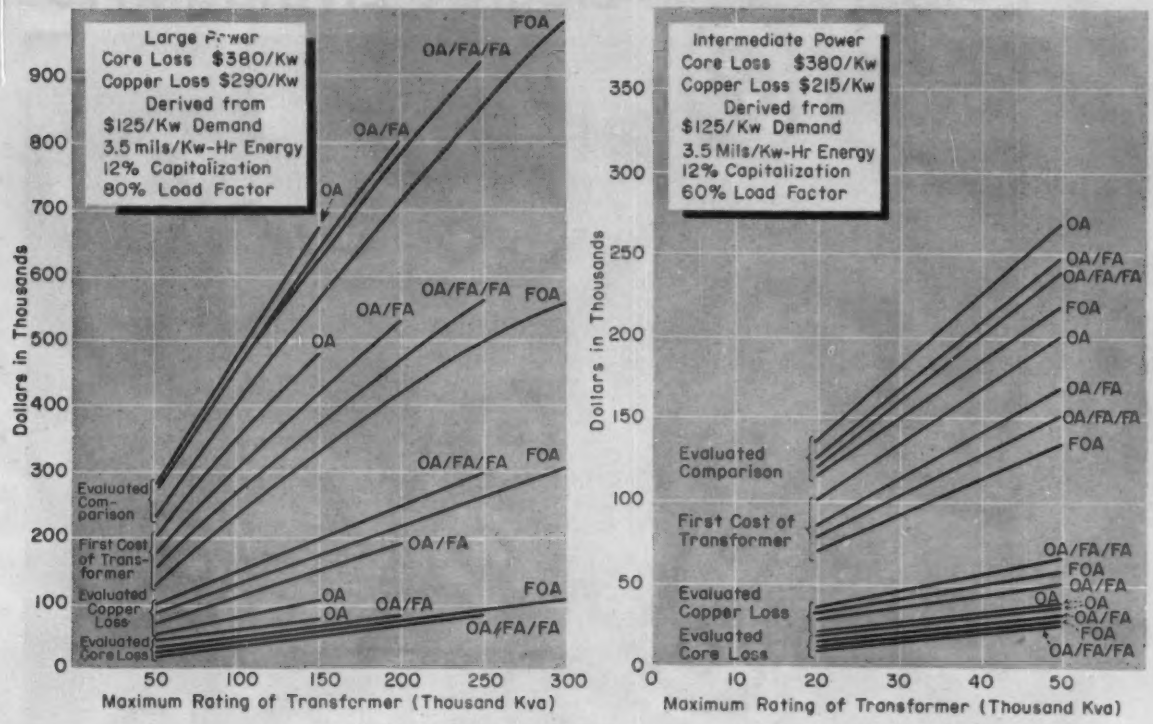
Self-cooled (OA) transformers have highest first cost; 133% (OA/FA) one-step fan units are approximately 15% less expensive; and 167% units (two-step fans or fans and pumps) have 10% lower cost than OA/FA. Least expensive are forced oil transformers whose first cost is about 30% less than self-cooled units and 10% less than 167% fan-cooled units.

On an evaluated comparison of first cost plus losses, FOA is about 10% less expensive than any other cooling method across the entire range. Single-step fan-cooled (133%) and triple-rated (167%) units almost coincide at approximately 10% higher. Self-cooled transformers evaluate an additional 5% higher than fan-cooled units. Although the values used are representative of those used by the industry today, it is interesting to note that significantly different values fail to bring any other cooling method below FOA in this basic economic comparison.

Installation expense is another factor in favor of forced oil cooling. Units as large as 200,000 kva can be shipped upright in a one-piece tank with cooling equipment in place. With load-tap-changing equipment, the upper limit for shipping almost completely assembled is around 75,000 kva. Even a 500,000-kva, 330-kv, generator step-up transformer can be built for shipment upright in a one-piece tank.

A forced-oil-cooled power transformer takes less than half the floor space of units based upon the next smallest cooling method. Often this can be evaluated in terms of reduced enclosure cost. A well-de-

Basic Economic Comparison of Cooling Methods Shows FOA Cheapest



signed forced-oil unit will have a higher load-carrying capability in its small enclosure because cooling air is blown to the tank wall for discharge straight above the transformer. Thus, recirculation of hot air through the cooling equipment is minimized. Even where space is not at a premium, the forced-oil transformer permits smaller foundations and a less elaborate station steel structure.

Three other factors are sometimes considered in economic studies of cooling methods—auxiliary power requirements, reactive losses, and impedance. These are very minor in comparison with the basic factors of first cost and kw losses. Auxiliary power requirements of a forced-oil-cooled transformer will not exceed 5% of total losses and will approximate those of a triple-rater. For a conventional fan-cooled transformer, these losses would be about 2½% of total loss. Reactive losses and impedance of forced-oil-cooled units, which are customarily slightly lower than those of the triple-rater and slightly higher than the OA/FA, can be adjusted to a common base with simple design modifications and capacitors at rather small cost.

This discussion has not yet considered the possibility that the utility may encounter decreased operating reliability, shortened life, or increased maintenance and operating expense in using forced-oil-cooled transformers. Thermal reliability of core and coils and the operating reliability of pumps and of pump-and-fan power require consideration.

In the familiar self or fan-cooled transformer, the relative weights of the various columns of oil throughout the unit determine largely where and how fast the oil will flow. Nonflow or restricted flow conditions can produce trouble spots. This difficulty is somewhat self-correcting, for excessive heat in some pocket increases the temperature of adjacent oil so that the latter moves faster and cools accordingly.

But the oil in a forced-oil-cooled transformer goes where the pump forces it, not necessarily where the heat is. The manufacturer must control and coordinate four important design factors to produce an FOA transformer superior to a self-cooled or fan-cooled one. These considerations are:

1. Distribution of heat sources throughout core and coils. **2.** Circulating enough oil to each heat source to carry the heat away. **3.** Maintaining correct oil velocity over each heat source (cooling effectiveness varies with velocity). **4.** The thickness of solid insulation over each heat source.

A well-designed and well-built forced-oil-cooled transformer uses diaphragms, cylinders, baffles, and orifices in combination with low oil temperature rise through the core and winding structure. These features assure that the hottest spot in the equipment is well within the same hottest spot temperature limits met by a well-designed self or fan-cooled unit.

If the four design factors mentioned are properly coordinated, each gallon of oil (not just the average) will be required to pick up only enough heat to increase its temperature 2 or 3 F as it passes through the interior of the transformer. Thus, "top-oil increment" the principal contribution to "hot-spot temperature above average temperature" of the self and fan-cooled transformer is an almost negligible factor in a well-designed and well-built forced-oil-cooled unit.

(Continued on page 161)

Serves All-Electric Living in 452

OUTSIDE VAULTS contain five 400-kva transformers, three of which are networked on the 120/208-v side and the others supplying 265/460-v for air conditioning. The 13.2-kv feeders go to five power transformers

SECONDARIES run through 32 4-in. fiber conduits to the building. Two separate banks, each of two ducts, contain lower voltage cables, and 8 ducts the higher voltage power cables

Apartments

All-electric living is featured at the recently opened 452-unit deluxe apartment house that has the largest service entrance of any such building in Washington, D. C.

Year-round air conditioning and electric kitchens including ranges, dishwashers, disposals, and refrigerators combine for a total connected load of 6,700 kw. Although this giant apartment provides Potomac Electric Power Co with an estimated $58,500 annually, the cost of service facilities was also big.

How Pepco serves the load is illustrated in the photographs.

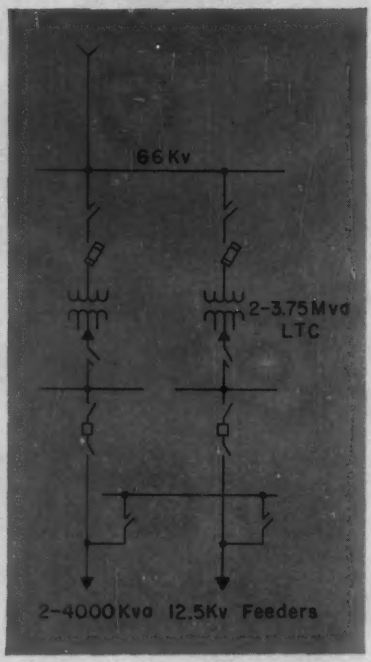
SECONDARIES are 500-MCM single-conductor 600-v cables. The 120/208-v four-wire lighting service has 16 rubber-insulated cables per phase and four bare neutrals. Four cables per phase and two bare neutrals carry 265/460-v four-wire service to cooler compressors

LOWER-VOLTAGE SERVICE is controlled by four pressure switches near their load centers. Two are 1,200 amp, the others 1,600 and 3,000 amp. Large risers carry 120/208-v service to 70-amp load centers in each apartment. Two 1,200 amp switches control higher voltage

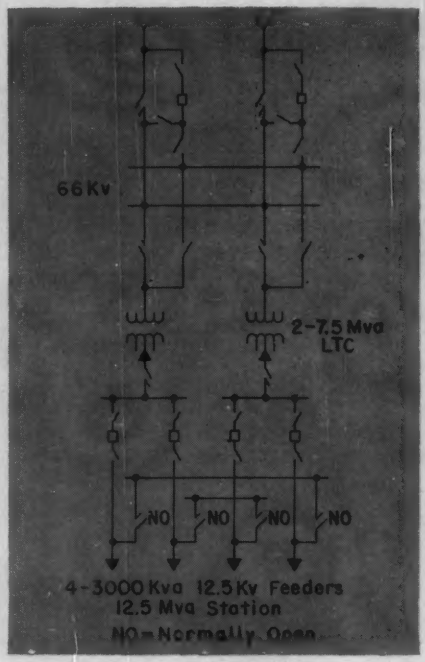
Economics Favor Big Substations

Study based on 24 square mile area:

- Considers substations of 12.5, 25, 50, and 75-Mva
- Plans step-by-step development over 27-year expansion period
- Shows annual costs using 75-Mva substations 25% lower than for 12.5-Mva



1 INITIAL SUBSTATION comprises 2 3.75-Mva transformers supplying two 4,000-kva 12.5-kv feeders



2 EXPANSION BEGINS with replacing transformers, adding feeders. Transfer bus becomes open "ring"

J. K. LAWLEY, Senior Electrical Engineer, Planning Section, Engineering Dept., Oklahoma Gas & Electric Co., Oklahoma City, Okla.

Rapid load growth, particularly in residential areas, where Oklahoma Gas & Electric Co's kilowatt-hour sales are doubling every 5.32 years, has prompted a reappraisal of practices with regard to substation sizes. In order to provide facilities with greater margin for future load growth, 66-kv subtransmission and 12.5-kv distribution have been established as company standards. However, although 12.5-kv has been accepted by the industry and by OG&E, there has been an accompanying uncertainty in sizing substations for a feeder voltage that has nine times the reach of 4-kv distribution.

OG&E established a standard ultimate size of 50 Mva for 66kv/12.5kv substations three years ago, but the rapid rate of load growth prompted a recent study to determine whether changes should be made in the standard.

Variables that were considered in determining the most economical substation size were substation cost; transmission and distribution investments; and transmission, substation and distribution losses.

Transmission costs considered were restricted to subtransmission lines required within the area plus differential costs of the transmission system outside the area. Only the costs of distribution feeder mains were compared, lateral costs being the same regardless of substation size. Only those losses which are influenced by substation size were considered. These were the losses in substation transformers, distribution feeders, and in a portion of the transmission and subtransmission systems.

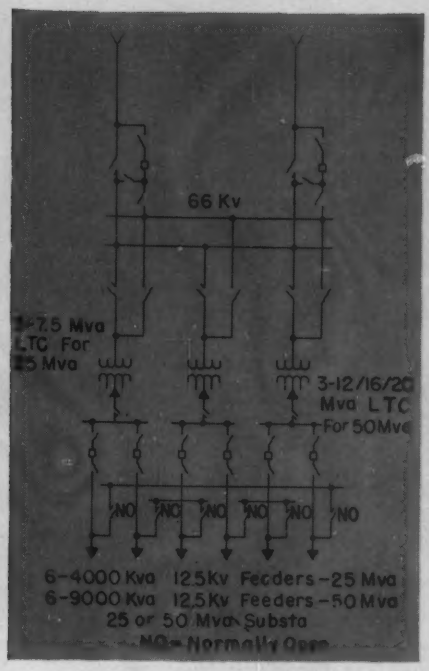
Four substation sizes were chosen for study. They were the 12.5, 25, 50, and 75-Mva sizes. Three-phase LTC transformers were used exclusively in the study. One line diagrams of the substations studied are shown in Figs 1, 2, 3, and 4.

Annual costs of serving a given area with each size substation were compared. Period of the study was from an initial load density of 1,000 kva per sq mile to 13,110 kva. This range in load density was determined as the growth required to develop the larger substations to full capacity. A uniform load growth of 10% per year was assumed although the residential load growth rate is considerably higher in some system areas.

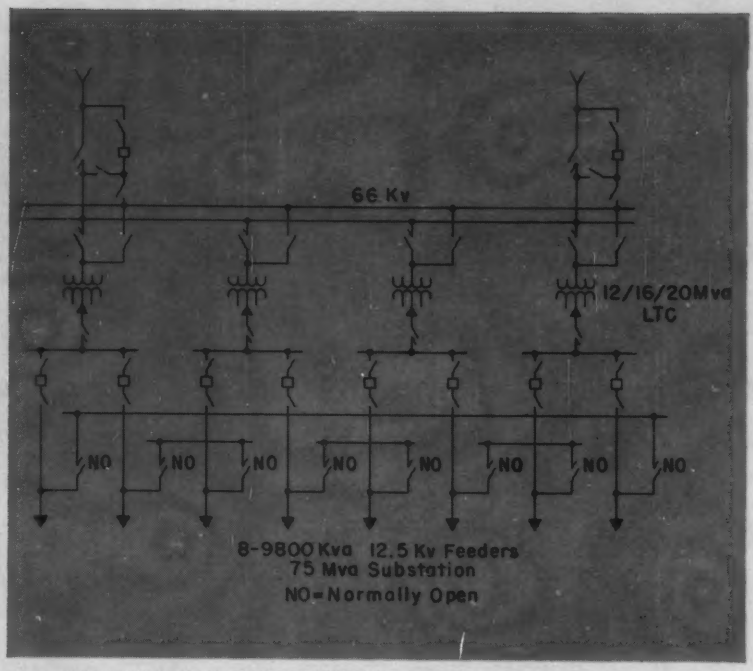
Assume 27-Year Growth

In a study of this type erroneous conclusions may be drawn if the costs of fully developed substations are compared as if all substations were installed at the same time. Where a considerable time elapses before full substation capacity is developed, the ultimate advantage of a larger substation may be offset by higher investment costs in the early years of operation. Therefore, a 27-year period was chosen for this study. This is the time required with a 10% annual growth rate, for a load density to increase from 1,000 to 13,110 kva per sq mile.

Nominal substation sizes were based on OG&E's transformer loading practices. These call for a base rating of multiple bank substations on the total absolute emergency FA capability of remaining transform-


66 Kv
1-7.5 Mva LTC For 25 Mva
3-12/16/20 Mva LTC For 50 Mva
NO
6-4000 Kva 12.5Kv Feeders-25 Mva
6-9000 Kva 12.5Kv Feeders-50 Mva
25 or 50 Mva Substa
NO=Normally Open

3 **CONTINUED EXPANSION adds third 7.5-Mva transformer for 25-Mva rating. Replacement boosts to 50**



4 **ULTIMATE PLANNED DEVELOPMENT of station sites provides for 12/16/20-Mva triple-rated transformers and eight 9,800-kva, 12.5-kv feeders for nominal rating of 75 Mva. Ring bus permits switching for emergency operation**

ers with one bank out of service. For example, the 25-Mva substation of Fig 3 has three 7.5-Mva transformers. One 7.5-Mva transformer has an absolute emergency capability of 12.675 Mva, or 25.35 Mva for the two remaining transformers when one is out of service. The other three substation sizes were rated in the same manner.

Fig 1 shows the one-line diagram for the initial installation. The basic one-line diagrams of Figs 1, 2, 3, and 4 permit expanding substations in a multiplex pattern as required.

Limit Interrupting Duties

With the larger transformers, particularly the 12/16/20-Mva size, additional impedance in some form will be required to limit the duty on distribution fuses and reclosers. A previous study indicated that the most economical way of doing this is by using a combination of a higher impedance transformer plus a neutral reactor.

The size of the area to be studied was determined on the basis of the area a single substation can serve at the ultimate load density. With this information a large hypothetical residential area of 24 sq miles, embracing several substations, was selected.

After the area and substation sizes for the study had been selected, the substations and transmission and distribution facilities were platted for the ultimate load density. A guide was then set up for the expansion of substation, transmission, and distribution facilities for the 27-year period of the study. These ultimate area layouts for the four substations are shown in Figures 5, 6, 7, and 8.

A transmission source was assumed to be available at one side of the area and an alternate source at the opposite side. Only the interconnecting subtransmission system within the area plus differential costs of transmission investment outside the area were included in the study as part of the investments.

Plan Comparable Service Reliability

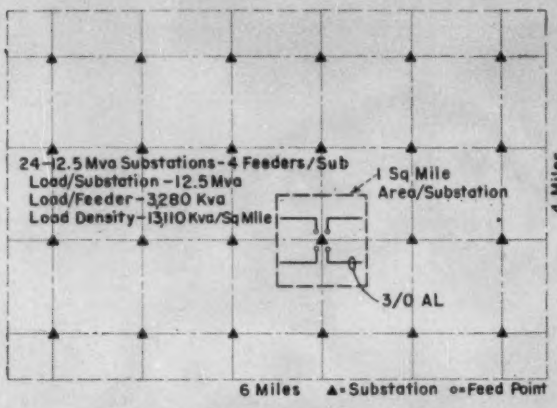
In the layout of the subtransmission system the same degree of service reliability was used for all schemes. For example, the larger-size substations ultimately required circuit breakers at all terminals; whereas smaller sizes only required breakers at alternate substations.

At an initial load density of 1,000 kva per square mile, four substations were required to serve the 24 sq mile area. The one line diagram, Fig 1, was used for the initial installation for all substations.

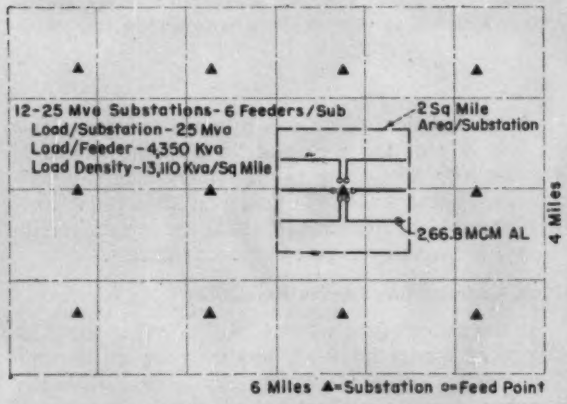
For the initial installation, substations were disposed within the area in keeping with the ultimate plan and in a position requiring the least subtransmission and distribution. From this initial pattern, substations and their associated subtransmission and distribution systems were expanded and evaluated throughout the 27-year period of growth to the ultimate capacity. The timing of expansions was determined either by substation and feeder overloads or by excessive voltage drop.

Primary voltage drop from the first to the last customer was limited to 3% maximum. A power factor of 95% was used in all voltage calculations. Laterals were assumed to have uniform spacing ranging from 0.15 to 0.075 miles depending on load densities.

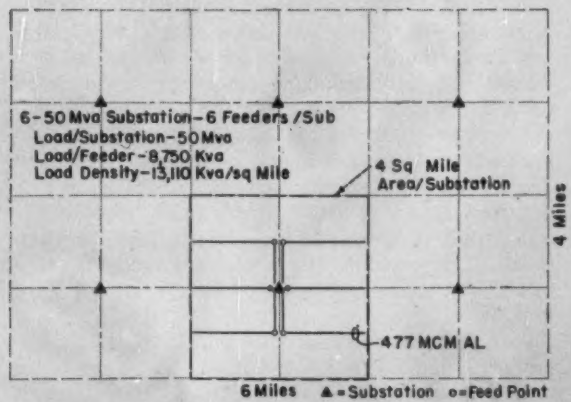
A detailed estimate of installed costs was prepared for the step-by-step expansion of each substation to its ultimate capacity. A uniform cost of $10,000 was charged for the purchase and development of each substation site.



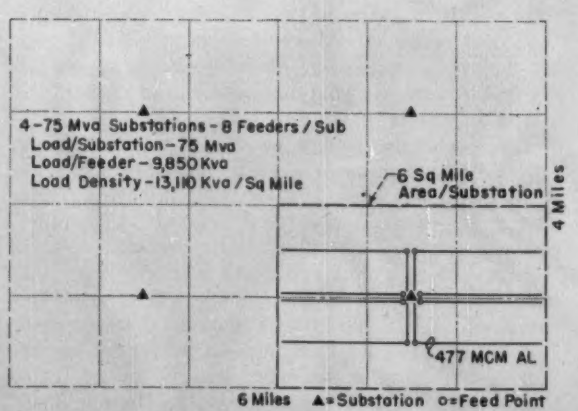
5 **SERVING 24-SQ-MI AREA with 12.5-Mva, 4-feeder substations requires 24 sites for ultimate development**



6 **25-MVA SUBSTATIONS, with 6 feeders in each, serve same 13,110-kva/sq-mi load from only 12 sites**



7 **ONLY 6 SITES ARE NEEDED if substations are boosted to 50 Mva with 6 feeders originating from each site**



8 **A MINIMUM OF 4 SITES can serve 24-sq-mile area if each station is 75-Mva with eight 12.5-kv feeders**

Subtransmission and distribution line costs were estimated as follows:

66-kv subtransmission, 636-MCM ACSR, $21,145 per mile, 795-MCM ACSR, $23,000 per mile;

12.5-kv distribution, 3/0 aluminum, $5,250 per mile; 266.8-MCM aluminum, $6,250 per mile; and 477-MCM aluminum, $7,000 per mile.

The prevailing installed cost of transformers was used for the 3.75 and 7.5-Mva sizes. For the 12/16/20-Mva size, 10% was added to the cost to allow for special impedances which may be required to limit the short circuit duty on the 12.5-kv buses.

A peak demand charge of $15 per kw was used for all losses. An annual energy charge of $4 per peak kw was used for copper losses and $14 for iron losses. The energy cost for copper losses corresponds to a system load factor of 50% and a loss factor of approximately 0.28.

These assumed costs for losses may be considerably less than those of other companies because of OG&E's comparatively low fuel costs.

Costs Drop As Subs Get Bigger

Comparative costs of the four substation sizes considered, Fig 9, trend downward as substation size increases. These costs are not in terms of a single substation but are costs of serving the entire 24-sq mile area throughout the 27-year period necessary to develop each substation to full capacity. Annual cost of the 75-Mva substation is 25% less than that of the 12.5 Mva but only 5% less than the 50-Mva. Fixed charges were assumed to equal 15% of the investment, and 6% compound interest tables were used in determining equivalent uniform annual costs.

Comparative costs of serving the area with the four substations after a period of 14 years are shown in Fig 10. The three larger substation sizes are at a break-even point at this stage. This indicates that the high investment in larger size substations during the early stages of development is more than offset by having to add four more 12.5-Mva substations to serve the area. It also shows that large substations are more economical even at moderate load densities.

Losses were not an important factor in the difference in costs of substations. Quite often, in similar studies comparing the economy of substation alternatives, losses are found to be much higher than these, especially for the large substation sizes. As a result the smaller size substations appear far more favorable. These misleading results are usually arrived at by assuming that the substations compared are all installed at the same time. This of course is seldom the case in practice. Large distribution substations grow step by step to full capacity; so losses should be compared on this basis.

Expansion to Ultimate Not Essential

Other considerations that are not altogether economic differences also influence the choice of a substation size. Some of the more significant ones are:

1. Larger substations require fewer sites and rights-of-way. Moreover, these sites are usually purchased in early stages of area development when property is likely to be cheaper, and, more important, there is a better chance of obtaining sites near the load center. There is also the public relations aspect which accompanies the purchase of every urban site.

2. To avoid feeder congestion and expensive underground feeder dips in certain areas, it may be more economical after a period of years to limit the growth of a substation to a smaller size than originally planned. However, in most cases of this kind, the cost of the investment in oversized buses and switch facilities would be extremely small and would perhaps be more than offset by the savings in a standard design.

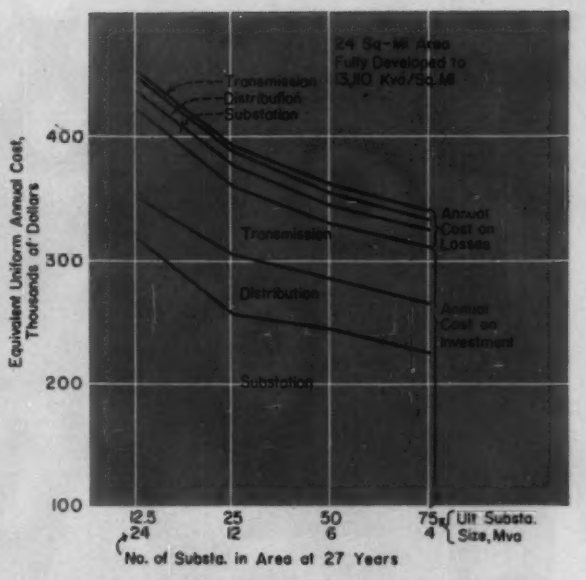
3. There are many areas such as small communities where the load will never reach the capacity of a large substation.

4. The study did not embrace a determination of the most economical capacity for feeders; yet the economy in larger substations depends to some extent on the use of circuits in the 9,000 to 10,000-kva range. There may be a reluctance on the part of some at present to accept this practice on the basis that feeders this large might have excessive exposure areas. However, throughout the study, 9,000-kva feeders were used at very high load densities where a feeder served a relatively small area.

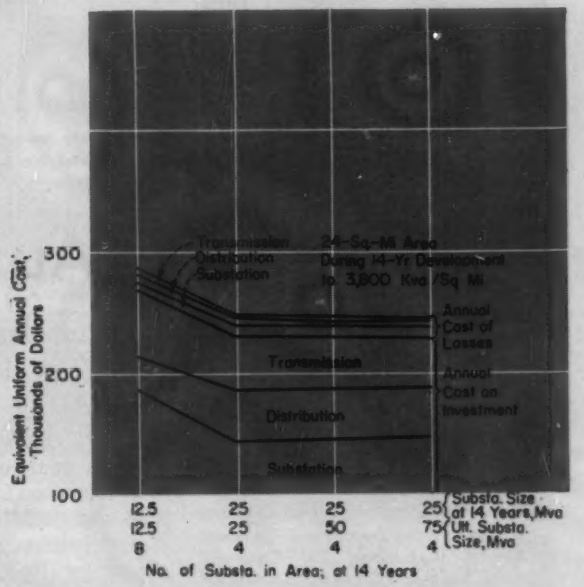
5. Larger substations may involve greater risk to service reliability when ultimate loads are approached, especially if the transformer supply is limited to a single 66-kv bus. Although the substation one-line diagrams used in this study show all transformers connected to a single supply bus, two 66-kv transformer buses with separate sources of supply can be formed from the main-auxiliary bus scheme without materially altering the relative annual costs of the substations compared. This would require adding a tie breaker between the main and auxiliary buses to form two automatically sectionalized transformer supply buses.

Results of the study show that a marked saving can be realized in using the large 66/12.5-kv substations. It does not point to the one most economical substation size, for it appears to be even larger than the sizes considered. However, there are also practical considerations which should influence the selection of a substation size.

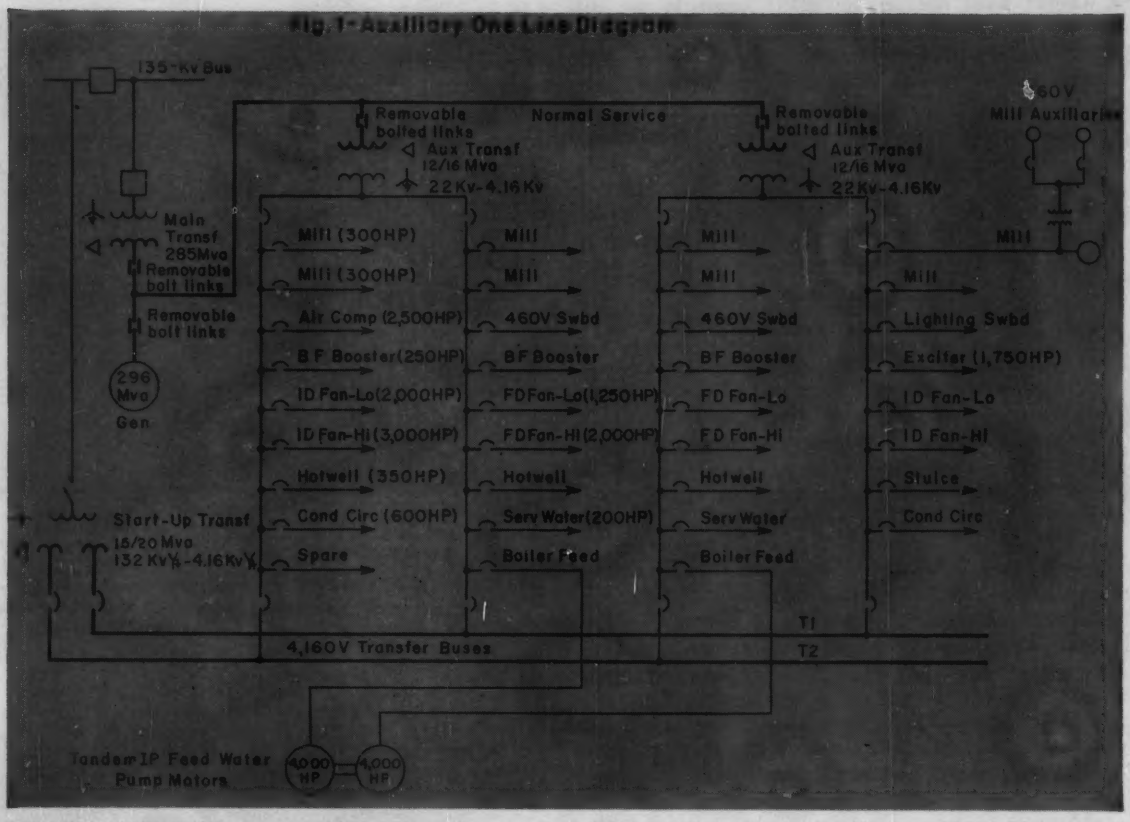
For maximum economy, substations today are designed with provision for expansion into large substations. At the same time, designs are such that there will be no appreciable economic loss if full expansion is never required. Under such a plan, most of the substations can be started out with the same basic one-line diagram and with little initial concern for the potential load in a given area. This minimizes the cost of misjudging tomorrow's load.



9 **COST COMPARISON for 27-year full-development period shows lowest annual value for the 24-sq-mile area using substations planned for ultimate of 75 Mva**



10 **COSTS BREAK EVEN AT 14 YEARS when any of three larger substations are applied to the growth pattern of the 24-sq-mile area assumed for this economic comparison**



FOUR AUXILIARY BUSES are served by two auxiliary transformers and two emergency transfer buses supplied by a double-winding start-up transformer. The basic system is flexible enough to be used for units up to about 400 Mw

BF Pump Fixes Auxiliary Design

Auxiliary power system for supercritical pressure unit must supply 10.4 Mw for the feed pumps. Total auxiliary power needs are 20.7 Mw

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S. B. ROCK, Senior Project Engr, Mechanical Engineering Department, Cleveland Electric Illuminating Co, Cleveland, Ohio

Use of the supercritical pressure cycle had an important bearing on the design of the auxiliary power system for the 250-Mw Avon No. 8 unit. Two particular characteristics of the supercritical steam cycle which played an important role in the design of plant auxiliaries and their power supply were:

1. The extremely pure water and steam required for operation at supercritical pressures make it imperative that loss of steam through the safety valves must be kept to an absolute minimum.

2. The need for a 4,500-psi pressure rise across the boiler feed pumps requires a sharp increase in power for feed pump drive, and hence in the overall plant auxiliary power system.

As a result, electrical auxiliary power requirements for normal full load will be 15.5 Mw, including 5.2 Mw for one half-size motor-driven boiler feed pump. Total auxiliary power requirements, including one turbine-driven feed pump, will be 20.7 Mw, or 8.3% of generator gross capacity.

The 250-Mw unit will operate with throttle steam conditions of 3,500 psig at 1,100F/1,050F. The monotube steam generator will be a pulverized coal-fired unit of dual furnace design.

The electrical auxiliary system is designed to reduce trip-offs or load reductions caused by failure in the auxiliary power system to a practical minimum. In addition, motors are transferred to facilitate quick restart after a trip-off has occurred from causes other than the auxiliary system.

This system, shown in Fig 1, offers the best combination of economy and reliability, because standard 250-Mva switchgear and 4,000-v motors can be used without exceeding permissible limits for voltage dip when starting the largest motor or transferring an auxiliary bus. In addition, the basic system

is flexible enough to be used for units up to 400 Mw.

The major factors which permit serving such large units with 250-Mva switchgear at this voltage are:

1. Four auxiliary buses to provide diversity of load, permit transfer and start-up of small segments of auxiliary loads, and reduce momentary duties.

2. Two normal service transformers, double winding secondary for the start-up transformer, and double transfer bus to reduce duties.

3. Tandem motors for the boiler feed pump drive to reduce voltage dip and momentary duty.

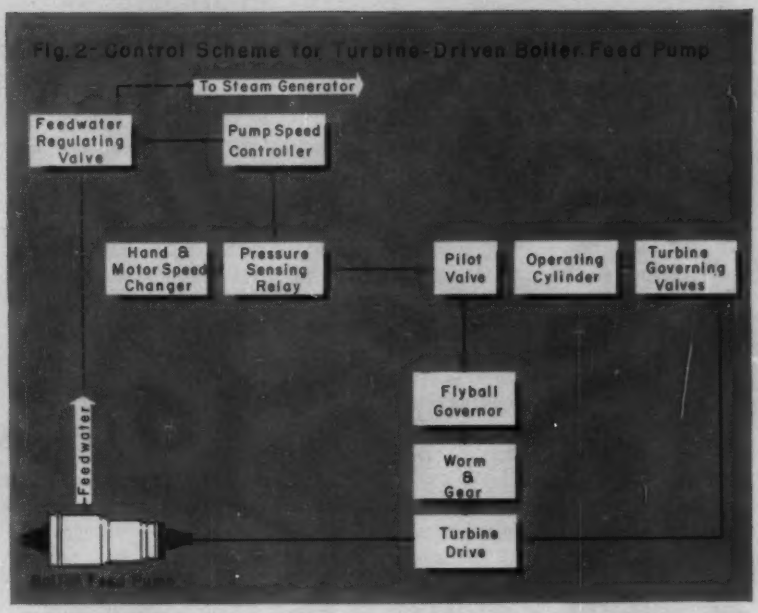
Tandem motors to drive the feed pump through a fluid drive were selected because a single 8,000-hp motor would have imposed too great a voltage dip upon starting. Including cost of breakers, cable and installation, two motors in tandem save 5% for this application. One of the 4,000-v motors is started with the fluid drive at maximum slip and the other is automatically energized when the first comes up to speed.

The start-up and normal service transformers are sized so that one of the normal service transformers can be taken out of service and full load carried on the unit by supplying one auxiliary bus from the start-up transformer and one from the other normal service transformer.

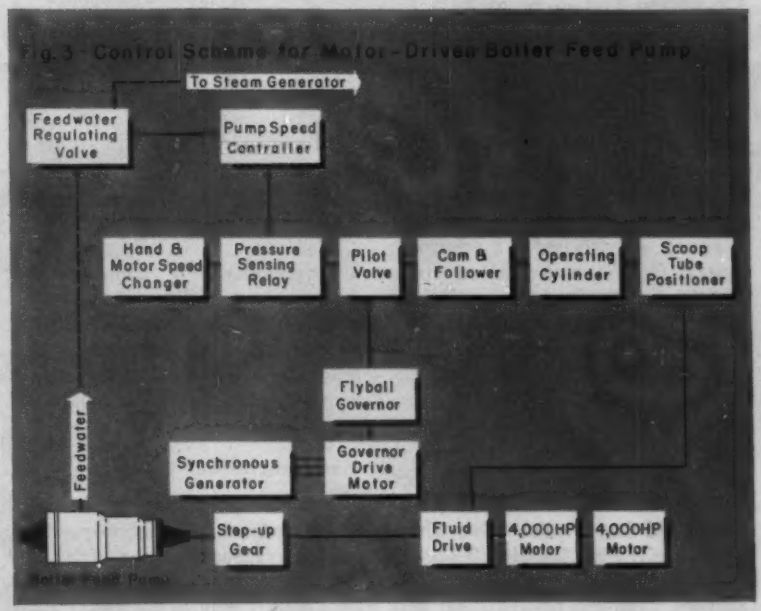
Maximum voltage dip occurs when automatically closing an auxiliary bus section to the transfer bus following a unit trip-out. At light system load, which is the most severe case, this dip is 19.6%. Because of the tandem motor design, starting the boiler feed pump motor from either the normal or start-up service produces a voltage dip of 15.2% at light system load conditions.

To provide added margin for voltage dip, all motors are normally operated at approximately 105% of rated voltage when the generator is at rated voltage. The ±5% range of voltage on the generator fixes the normal motor operating range between 100% and 110% of motor rated voltage.

All motors are specified to be able to start with 85% of rated voltage available at their terminals, and to ride through voltage dips to 70% of rated voltage for extended periods when they are operating at their maximum emergency loads.



SPEED CONTROL for the turbine driven boiler feed pumps will be initiated by impulses from feedwater regulating valve. Maximum speed will be 7,575 rpm



PARALLELING of motor and turbine drive pumps required a governor system for motor drives. Motor-driven pump supplies pumping power for loads below 30%

A number of pump and driver configurations were studied for the boiler feed pumps. Several of these involved accomplishing a portion of the feedwater pumping after the water leaves the high-pressure heaters. But reduction in heater cost made possible by such splitting of the pump work did not justify the added investment and operating costs.

It was therefore concluded that all feedwater pumping should be done ahead of the high-pressure heaters. In starting up, water must be circulated through the steam generator at full pressure before any

steam is admitted to the main turbine. Hence, no steam is available at these times for driving feed pump turbines. Because of the increased specific volume of the exhaust steam at light loads, turbines are incapable of supplying the feed pump requirement at loads below 30%. The motor-driven pump will be in service at these times.

Nevertheless, the increase in saleable power and the continuous availability of feed pumps during electrical disturbances in the plant favored the use of steam-driven pumps. For these reasons, one motor-driven and two turbine-driven feed pumps, each of half-capacity, were selected.

The 7,710-hp feed pump turbine drives will operate at a maximum of 7,575 rpm. Steam will be taken from the cold reheat extraction point of the main turbine and exhausted to the extraction steam line between the main turbine and the lowest feedwater heater.

Governing System Needed

At full load, with two turbine-driven feed pumps in service, a net plant heat rate of 8,630 Btu per kwhr is anticipated; with one motor and one turbine-driven pump, it will be 8,603 Btu per kwhr net.

To permit satisfactory paralleling of motor and turbine-driven pumps, it is necessary to install a governing system for the motor-driven pump equal in sensitivity and speed of response to the conventional governing system on the turbine drives. A system was devised whereby a flyball governor, similar to those mounted on the turbines, would be rotated electrically in direct ratio to the speed of the boiler feed pump.

The position of the flyball governor is fed into a pilot valve which also receives an impulse from the feedwater regulating valves. Operating through conventional hydraulic components, the signal actuates the scoop tube positioner which adjusts the amount of oil in the working circuit of the fluid drive. This system results in a satisfactory match of speed regulation characteristics to those of the turbine-driven pumps.

Block diagrams outlining the major components of the two governing systems are shown in Fig 2 and 3. In each system, the hydraulic pressure impulse reaches the pressure-sensing relay, through an integrating controller, from the position of the feedwater regulating valves. The signal then passes to a pilot valve whose position is adjusted by the pump speed feedback through a flyball governor.

In the case of the turbine-driven pump (Fig. 2), this governor is geared directly to the turbine shaft. The pilot valve output signal is then sent to an operating cylinder which positions the turbine governing valves.

Two-Speed Fan Motors Used

For the motor-driven pump (Fig 3), the flyball governor is rotated by a motor which in turn is driven by a synchronous generator geared to the shaft of the step-up gear. Included in the linkage between the pilot valve and operating cylinder is a cam which serves to linearize the speed change characteristics of the scoop tube.

In both governing schemes, ample provision is made for field adjustment of speed regulation.

Two fundamental considerations led to the use of two-speed motor drive for the vane-controlled fans:

1. Experience has shown the need for wide design margins to compensate for fan wear, air preheater plugging, and a variety of coal characteristics.

2. Vane control of fans permits a closer match of constant-speed driver output and system head characteristics than would be possible with the boiler feed pumps. This tends to diminish the potential economies inherent in variable-speed operation.

Most Economical Operation

The two-speed fan is not intended as an approach to variable-speed operation. Basically, the fans are designed to carry the expected full-load requirement in low speed. Considered as a single-speed motor under these conditions, operating economy can be achieved by avoiding the slip involved in variable speed couplings. The second or "high" speed is considered to be low-cost reserve capacity for use only during unusual operating conditions of relatively short duration. Viewed in this light, the two-speed fan with vane control appears to be a more practical solution to the problems of economical operation, while maintaining generous reserve capacity, than the variable speed fan with single-speed motor.

While the controls on the monotube steam generating unit are arranged to prevent damage to equipment and piping following emergency trip-off, it is desirable to prevent blowing the safety valves in order to avoid loss of highly purified water and to keep the unit under control of the operator.

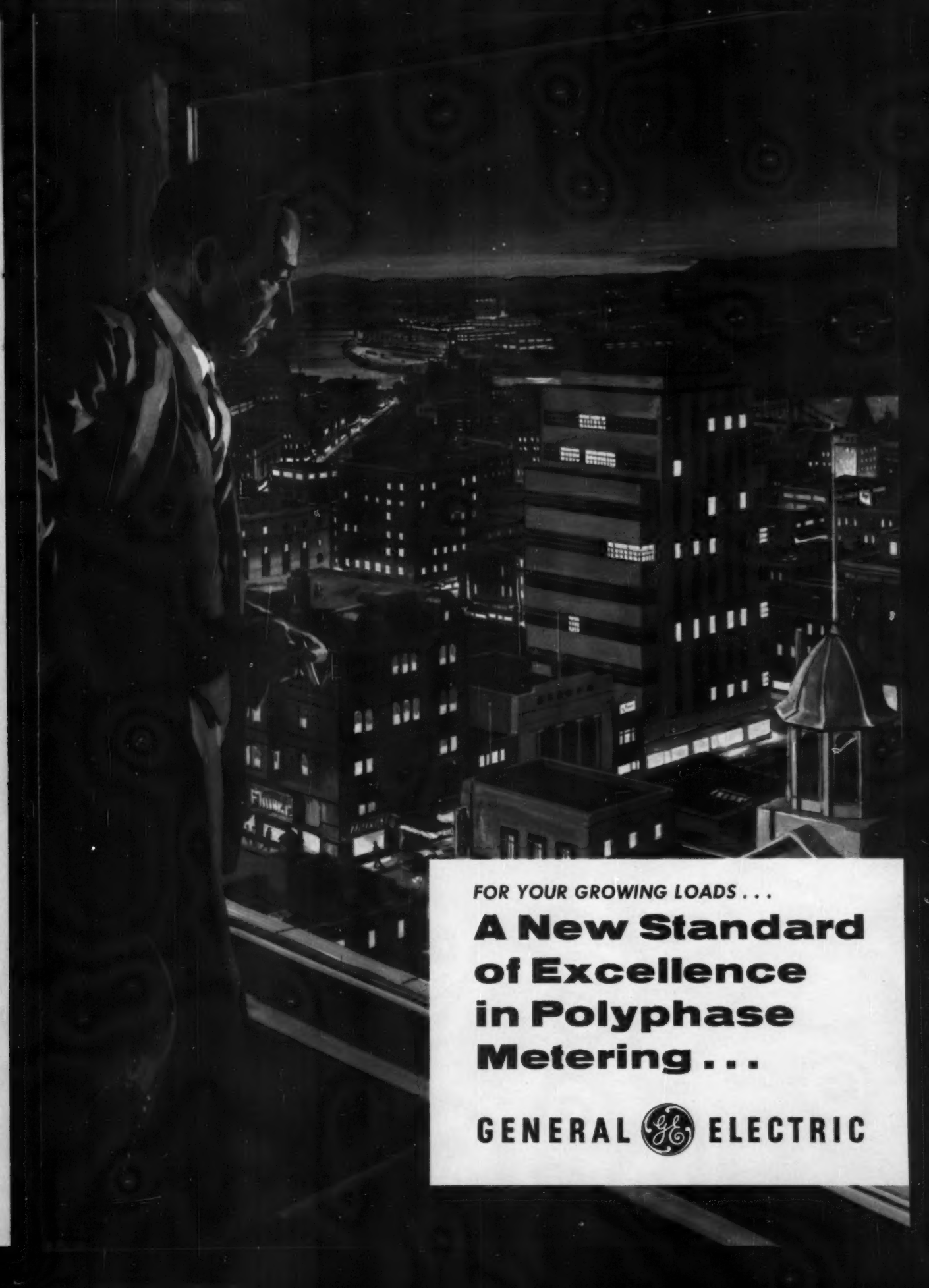
To accomplish this, selected motors are transferred to the start-up source as soon as possible after emergency trip-off in order to maintain operation of the steam generator.

Voltage Relay Starts Transfer

Upon tripping the unit, all normal supply breakers are opened and breakers for those auxiliaries, which should be transferred, are left closed through a preferential arrangement. All others are tripped. A relay monitors the voltage decay on each auxiliary bus and closes the transfer breaker when the voltage on the bus has decays to 50%. The rate of voltage decay on each bus is governed by the inertias and time constants of the motors, as well as the inertias of the driven equipment, connected to each bus at the particular time. Thus, a random closing to the transfer bus is achieved with slight probability of two auxiliary buses closing simultaneously. Interlocks prevent transferring if a bus is faulted. Buses are not transferred if the new source voltage is inadequate.

The auxiliaries transferred through a preferential arrangement include one induced-draft fan, one forced-draft fan, two boiler feed boosters, two hotwells, two condenser circulators, lighting and 460-v transformers, and the tandem motor-driven boiler feed pump. The latter will be started automatically if it has not been running before the trip-off.

The open-circuit period has been reduced to a minimum by the arrangement of motors on each bus to facilitate rapid voltage decay and rapid transfer. With this method of emergency transfer, we shall be able to maintain the unit under the control of the operator and quickly re-synchronize after the cause of trip-off has been determined and rectified.


FOR YOUR GROWING LOADS . . .
A New Standard of Excellence in Polyphase Metering . . .
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30 AMPERES
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V-60 POLYPHASE METERS

by GENERAL ELECTRIC give you all the advantages of magnetic suspension plus extended range

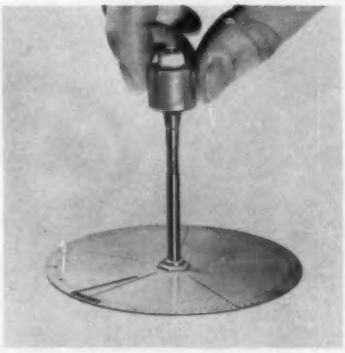
Now for fast-growing polyphase loads everywhere, General Electric's New V-60 Polyphase Meter Family with magnetic suspension gives you greater sustained accuracy, eliminates bearing replacement, helps reduce installation costs and offers you extended current and potential range in just five different meters

YOU GET FLEXIBILITY in metering your various polyphase loads with just five different meters. The new General Electric V-60 family of polyphase meters includes the V-62 network meter, V-63 (3-wire, 3-phase), V-65 (4-wire, Y, 3-phase), V-66 (4-wire, △, 3-phase), and V-68 (totalizing). The extended range—666 2/3% of nameplate rating—means that any of the V-60 family of meters will stay on the job as your polyphase loads climb, whether the loads are residential, commercial, industrial, or special loads such as air conditioning.

YOU GET GREATER SUSTAINED ACCURACY in the new V-60 meters because *magnetic suspension* avoids losses in registration caused by bearing wear. In the V-60 meters, you get the advantages of sustained accuracy which were time-proved in the more than 8 million I-50 series of single-phase meters in service today.

YOU DON'T HAVE TO REPLACE BEARINGS in the V-60 meters because with the *magnetic suspension* system there are no bearings! General Electric *magnetic suspension* cannot wear out . . . even after the equivalent of 300 years on accelerated life tests. With ever increasing polyphase loads, bearings in conventional meters become worn in a few years. With the new V-60 meters, you can lower metering costs by eliminating bearing replacement, due to bearing wobble and inaccurate performance.

YOU CAN SAVE TIME AND MONEY in installing and leveling meters because with the new V-60 family, meter tilt is a negligible factor. Any ordinary meter operating at even a slight tilt will give inaccurate readings and will result in substantial revenue losses. Lab tests prove that G-E meters with *magnetic suspension* practically eliminate revenue losses due to tilt.



For more information on the new V-60 family of polyphase meters, or on any of the complete G-E line of meter products, contact your nearest G-E representative or Apparatus Sales Office, or write General Electric Company, Section 623-1, Schenectady 5, N. Y.

GENERAL ELECTRIC

NOW FROM GENERAL ELECTRIC...

Get Accurate Metering of Heavy Residential Loads with the New V-62 Meter

New General Electric Polyphase Network Meter, first of the new G-E V-60 family of polyphase meters, gives you all the really great advantages of the time-proved I-50 series of single-phase meters.

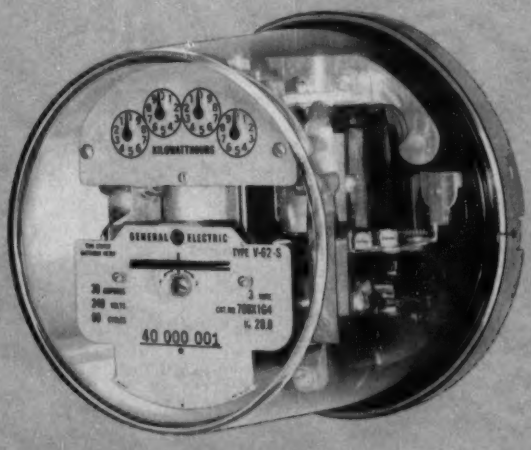
FOR GROWING POLYPHASE LOADS of both today and tomorrow, the all-new V-62 meter with *magnetic suspension* is available in both Class 100 and 200 ratings in either socket or bottom-connected types. In addition, this new network meter can be used in your 3-wire, 3-phase applications.

MAGNETIC SUSPENSION in the V-62 gives you the real advantages of greater sustained accuracy and no bearing replacement. You can lower your installation costs by spending less time and money on troublesome leveling of meters, since meters with *magnetic suspension* are less affected by tilt.

EXTENDED RANGE of the V-62 allows loads up to 666 2/3% of rated current to be metered without the need for current transformers. This means that meter replacement is unnecessary as polyphase network loads grow — whether the loads are residential or commercial.

MAXIMUM SURGE PROTECTION comes from coordination of surge-relief gaps and butyl-molded coil insulation. The revolutionary new gap system in the V-62 provides outstanding surge-current relief and helps avoid lightning damage and costly meter burn-outs.

ADDITIONAL FEATURES of the new V-62 network meter are ease of assembly and disassembly, excellent calibration stability, high corrosion resistance, interchangeability of registers with present meters, outstanding single-stator performance, and improved nameplate visibility.



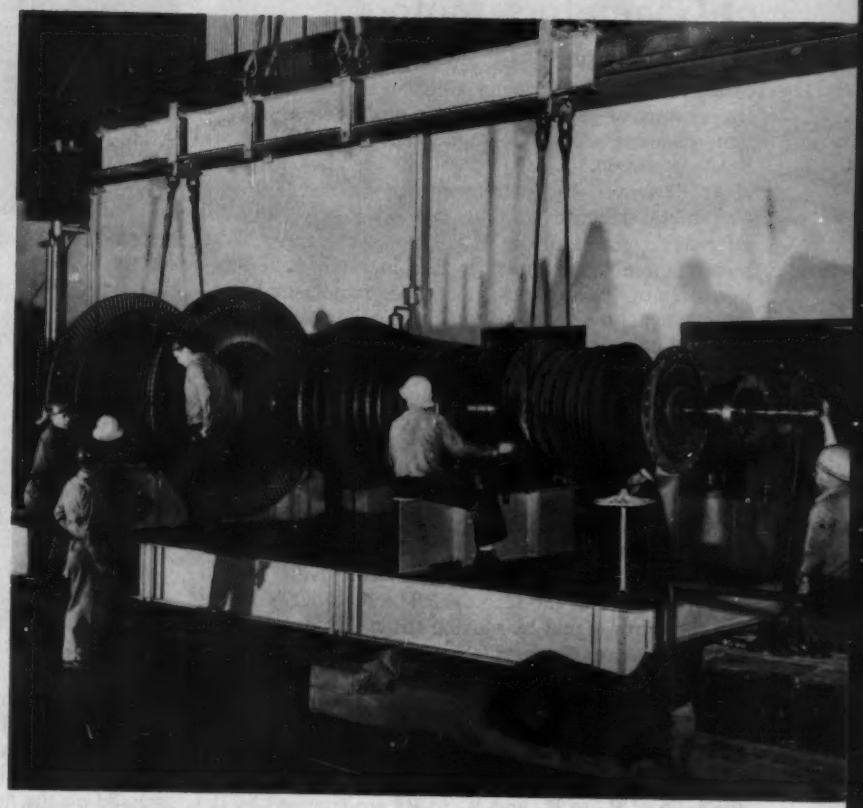
GET ALL THE DETAILS OF THE NEW V-62 METER BY CONTACTING YOUR G-E REPRESENTATIVE OR APPARATUS SALES OFFICE, OR BY WRITING SECTION 623-1, GENERAL ELECTRIC COMPANY, SCHENECTADY 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Special Car Speeds Rotor Spindle Overhaul

GENERATION—Maintenance



An especially designed and constructed spindle carriage car facilitates annual maintenance checks on turbines at Metropolitan Edison Co's Titus station. In a recent check on Unit No. 1, this car was towed across the turbine room floor loaded with the 42-ton rotor. When the rotor had been sandblasted out of doors, it was brought back again into the turbine room for repairs.

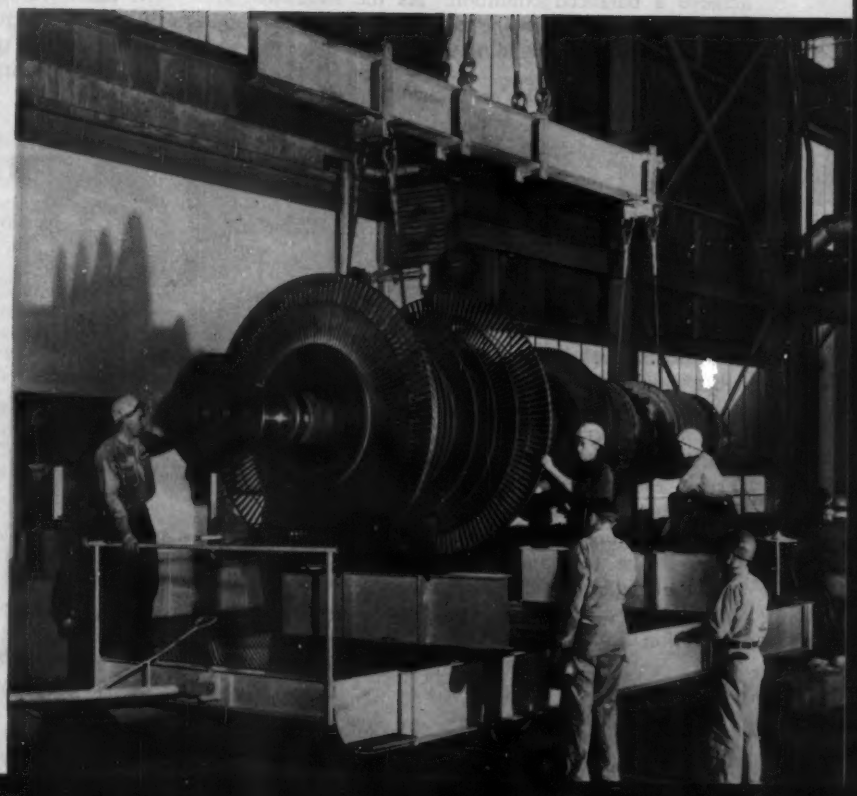
Before the spindle car was constructed by station personnel, a railroad flatcar was rented for moving the rotor. The new car not only speeds up handling time, but makes work easier for the maintenance crew in loading and unloading the rotor.

Titus station uses the spindle car about 30 days out of each year for servicing its three turbine units. Formerly the heavy wooden structure on which a turbine rotor was delivered was used to support a rotor during the overhaul work. But this structure had deteriorated to a state in which it was considered not safe. Its replacement by a similar structure would have cost as much or more than the new car.

As the car was designed specifically for the job it performs, it is lower and much less cumbersome than the railroad flatcar, and plant personnel can use it so as to save time and put equipment back in service with only a minimum of outage time.

Construction of the 15-ton car took 265 manhours. As most of the material used was scrap steel and salvaged railroad car parts, the total cost of material amounted to only $217.50. Labor was $531.19, bringing the overall cost to $748.49, a small amount for so valuable a piece of equipment. As no blueprints, formal plans, or specification were drawn up for the project, much credit is due members of the construction crew for their demonstration of skill and craftsmanship.

(More How To on page 104)



NEW DESIGN TREND

Takes Field Temperatures of Generators, Motors

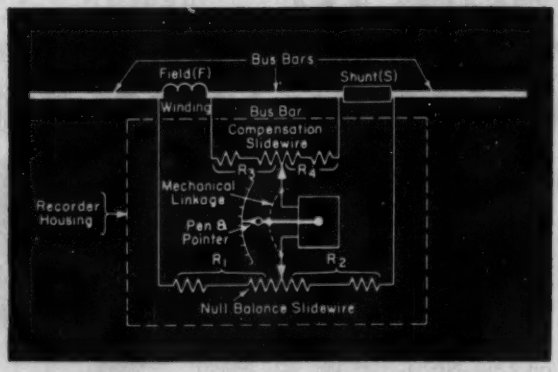
A Kelvin double-bridge circuit with standard indicating recording instruments conveniently measures the temperature of generator field windings. The combination relates conductor resistance changes to the temperature sought.

As developed by instrument department engineers of General Electric Co, the method is applicable to all electric generators in today's power plants. Used mainly on ac generators, it can measure field temperatures of synchronous motors, dc motors and generators, synchronous converters, and condensers.

The combination accurately gauges resistance changes which, in copper and aluminum conductors, are directly related to temperature changes. In the circuit illustrated, one arm of the bridge is the field winding whose resistance varies with temperature. A shunt having a zero-temperature coefficient is the second arm of the bridge and is in series with the field winding. Other arms are resistors of known resistances.

As the resistance of the field windings changes with temperature, the bridge is unbalanced, giving rise to an error signal at the recorder. The recorder balances out this error signal by moving the null balance slidewire to where the resistance ratio R_1/R_2 is equal to F/S.

The bus bar compensation slidewire corrects for the resistance of the bus bar connecting the shunt to the field winding and changes this resistance condition $F/S = R_1/R_2 = R_3/R_4$. As a ratio of F to S changes, the ratio of R_1 to R_2 and R_3 to R_4 are changed by the movement of the slidewires within the recorder to achieve a balanced condition. As the slidewires are linked mechanically to the pen and pointer, the temperature of the field winding is indicated when the circuit is in balance.



ROTOR TEMPERATURE SCHEMATIC shows input bridge circuit of recorder. Resistance is related to temperature

This instrument system has a recorder with a pen speed of 24 sec. This pen speed is sufficient to follow temperature variations, yet slow enough so that transients caused by field current changes are minimized.

The shunt in the diagram is not installed in the recorder. It is installed at a convenient position near the generator. It should be sized so that at maximum current output of the generator the drop across it is 100 mv.

Customer specifications for measurement systems should include scale and chart calibration, chart rotation time, and such optional features as internal illumination and alarm switches. The following information should also be supplied:

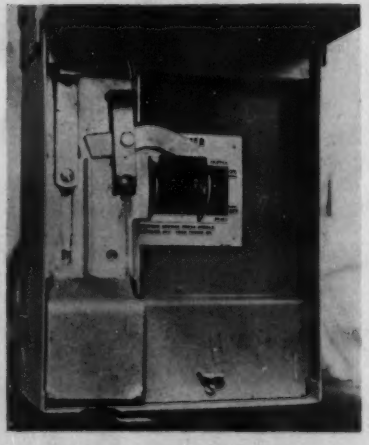
1. Measured rotor resistance at given temperature.
2. Material of rotor winding (copper or aluminum) or coefficient change of resistance with temperature.
3. Nominal field voltage—the actual voltage impressed on the field brushes, not the rated exciter voltage.
4. Shunt rating—maximum current rating to give 100-mv drop across the shunt.
5. Resistance of leads, including fuses, from the shunt to the instrument.

RELAYING

Links Emergency Generator Safely

Some farmers have a tractor or other small generator which they connect into the farmstead wiring system for emergency supply. Such generators create a problem for the farmer and the power company.

When the farmer connects his own generator, the company supply must be disconnected to prevent the small generator from feeding into the system. Unless proper protection is provided, the small generator may be burned up. Connection of this separate power source to the system could create a hazardous condition for power company servicemen who may presume the line is dead.

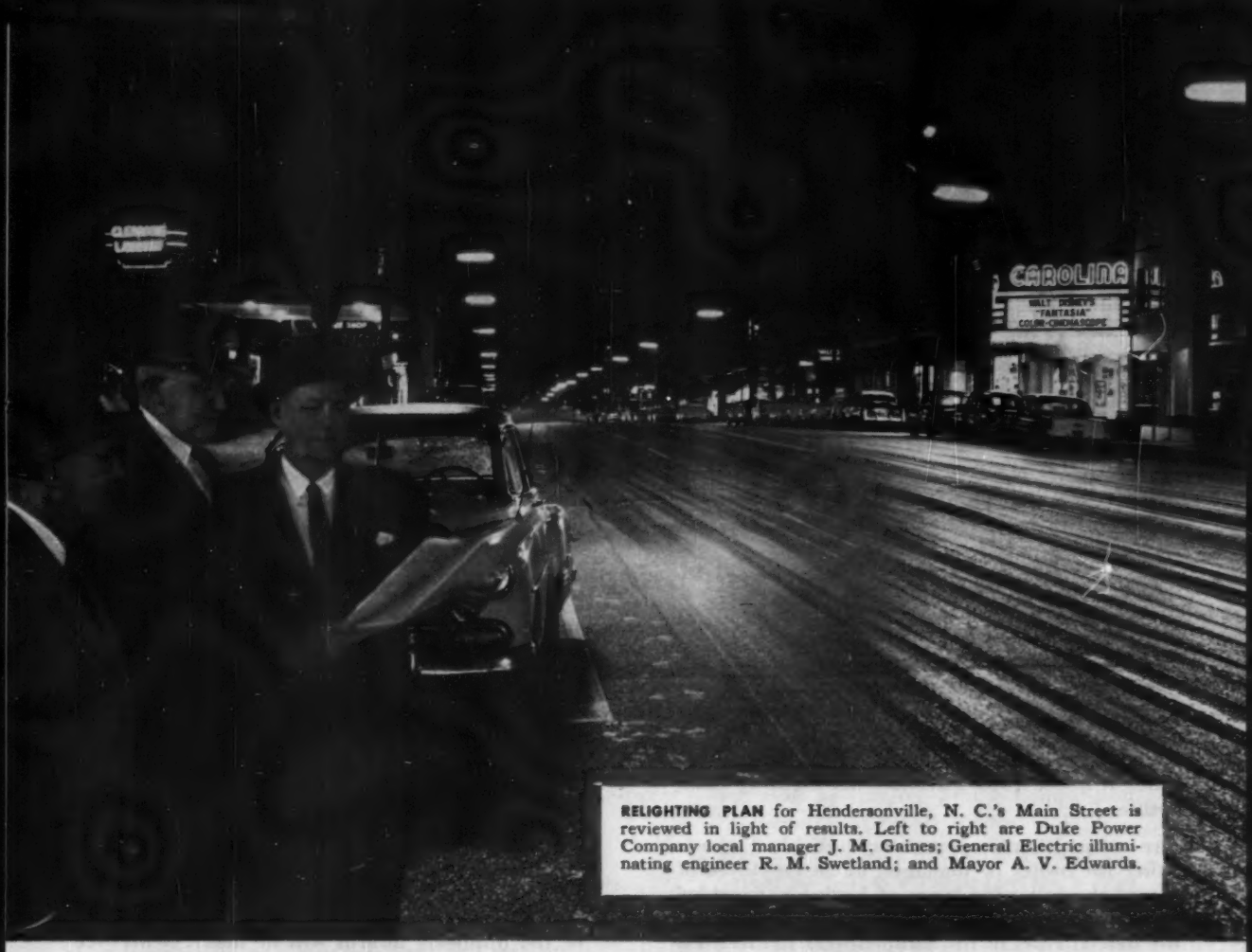


SWITCH OPEN, service is disconnected cover plate raised, exposing outlet

Has Double Purpose

Many farmers are served from poles, known as May poles, in the farmyard, with secondary circuits to the various farm buildings. To safeguard against the connection of his generator without disconnecting the power company supply, a special device has been developed. It has an interlock between the switch and outlet plug where the

(Continued on page 108)



RELIGHTING PLAN for Hendersonville, N. C.'s Main Street is reviewed in light of results. Left to right are Duke Power Company local manager J. M. Gaines; General Electric illuminating engineer R. M. Swetland; and Mayor A. V. Edwards.

Start-to-finish engineering help is part of General Electric's street lighting "package"

Initial survey, preliminary application investigation, action recommendation, complete Illuminating Engineering Report, for your staff or consultants . . . any or all of these services are included in the engineering aid "package" at your disposal when you place your street lighting business with General Electric!

General Electric has experienced outdoor lighting specialists in all key cities. Backing up these field specialists are more career lighting men at the Hendersonville, N. C., plant. The talents of both groups are available to you at all times.

Benefit from the years of street lighting experience General Electric has gained since Thomas Edison lighted the street in front of his home in 1879! Put this accumulated know-how to work devising the best means to bring greater visibility to your city's streets!

VISION-ENGINEERED SYSTEMS

Let G. E. help your street lighting program on a *vision-engineered system* basis. On every lighting project, regardless of size or type, General Electric offers, in addition to engineering aid:

PROJECT RESPONSIBILITY—one source of supply for *all* your street lighting needs. This includes full lines of filament, mercury, and fluorescent luminaires, and a complete selection of control and auxiliary equipment.

RESEARCH LEADERSHIP—the industry's newest and most complete laboratory, development, and proving facilities are located at G. E.'s "Outdoor Lighting Center of the World" in Hendersonville, North Carolina.

LIVE BETTER ELECTRICALLY

Get the full *vision-engineered system* story from your nearest Apparatus Sales Office or authorized agent! General Electric Co., Schenectady, N.Y.

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VISION-ENGINEERED STREET LIGHTING SYSTEMS

GENERAL ELECTRIC

TO BUILD YOUR LIGHTING BUSINESS . . .

Enter The 1957 International

Stories on top winning entries will be published in ELECTRICAL WORLD

Local publicity will stimulate lighting business!

$5,400.00 in cash prizes will be awarded!

Have you completed an outstanding lighting job since January 1st, 1956? Do you have one planned—or working—to be finished before October 25th, 1957? Why not let that job bring you extra profit . . . and industry-wide recognition? Enter it in the 1957 International Lighting Competition!

The competition is open to any individual who is either the owner or manager, or an employee of any of the following types of business, provided he complies with all the requirements outlined in the official rules of the competition: 1. Electrical Contractor. 2. Electrical Wholesale Distributor. 3. Architect or Engineer. 4. Electrical Utility.

The contest opens March 15th, and closes October 25th. Announcement of award winners will be made during the week of November 11, 1957.

The competition is sponsored by three McGraw-Hill publications: Electrical World . . . Electrical Construction and Maintenance . . . Electrical Wholesaling . . . with the cooperation of the National Lighting Bureau (National Electrical Manufacturers Association).

Commercial, industrial and institutional lighting installations winning cash prizes will be certified by the National Lighting Bureau, NEMA, providing the installation plans meet certification standards. Certificates will be presented to all cash prize winners, and honorable mention winners. In case of tie, duplicate awards will be made. Wherever practical, awards will be made locally; if possible at electrical group meetings.

Send in the coupon below for detailed information on the 1957 International Lighting Competition. Make your outstanding lighting job pay off in extra cash, and valuable public acclaim!

LIGHTING CLASSIFICATIONS:

Lighting installations are divided into six separate and individual groups. Separate awards will be made for each classification, within each contestant division. The installation classifications are:

1. **Industrial**
2. **Store**
3. **Office**
4. **Institutional**
5. **Outdoor Lighting**
6. **Residential Lighting**

PRIZE AWARDS:

The 120 cash prizes offered, total $5,400.00. There are five prizes for each of the six installation classifications, and these prizes are offered within each of the four contestant divisions. The prize awards for each classification and within each division:

First Prize: $100

Second Prize: $50

Three Prizes: $25 each.

JUDGING:

Competent and fair consideration for each entry has been assured through appointment of nine individuals, each a well-known authority in the field of illumination, to serve as judges. These individuals will form three panels of three members each, to judge the separate lighting classification groups. The decisions of the board with respect to awards and all other competition matters are final and binding on each participant. The competition and awards are subject to all applicable local, state and federal laws and regulations.

Lighting Competition!

OFFICIAL COMPETITION RULES:

RULE 1 – Application to enter the Competition must be made in writing. Applicant may use an Official Entry Application form, which will be supplied by the Lighting Competition chairman upon request. (In any case where the applicant is unable to obtain an Official Entry Application form, he may send in his request to enter by letter).

RULE 2 – Any individual–who may be the owner or manager, or an employee of any of the following types of business – may enter the contest. These types of businesses, which are to be known as Contestant Divisions, are: electrical contractor; electrical wholesale distributor; architect or engineer; and electric utility. Either individual or joint entries may be made; joint entrants must specify which Contestant Division they are entering.

RULE 3 – Entries must be made in one of the following Installation Classifications: industrial lighting; store lighting; office lighting; institutional lighting; outdoor lighting; residential lighting.

RULE 4 – Contestants or their firms must have been responsible for either the design, layout, sale or installation of the lighting installation covered by each entry. The contestant will state this eligibility by describing in detail in each entry the part he took in the design, layout, sale or installation. In the case of joint entries, each contestant must state in the entry the work for which he was responsible.

RULE 5 – A contestant may submit any number of entries.

RULE 6 – Each entry must cover one or more of the following:

a. A lighting installation for a single specific visual requirement.
b. A lighting installation for a specific area, large or small.
c. An overall lighting installation for an entire building, project or general area.

A lighting installation using any make, or brand, or type of electric lighting equipment, and based on any lighting system design or layout, regardless of whether such lighting equipment, lighting system design or layout conforms with recognized standards for good lighting practice, may be enter 1 in the Competition. The Board of Judges, however, will judge all entries based on those factors conforming with recognized standards of good lighting practice.

RULE 7 – Each entry must be submitted separately, in an official Competition Entry folder bearing an official Registration Number as assigned by the Competition chairman.

RULE 8 – All entries, to be eligible in the Competition:

a. Must be mailed on or before the closing date of the Competition (October 25, 1957), and must be received by the Competition chairman on or before November 4, 1957.
b. Must cover lighting installations completed within the period between January 1, 1956 and October 25, 1957.

RULE 9 – In submitting an entry, the contestant agrees to be bound by all rules of the Competition, and to abide by the decision of the Board of Judges, which will be final. All entries become the property of the sponsors of the 1957 International Lighting Competition, and no entry will be returned. All entrants, by submitting entries, further agree to grant the sponsors full reproduction and publication rights.

MAIL THIS COUPON FOR RULES AND ENTRY FORMS:

Berlon C. Cooper, Chairman
1957 International Lighting Competition
330 West 42nd Street
New York 36, N. Y.

Please send me the rules brochure and ____ entry forms for the 1957 International Lighting Competition.

Name _____

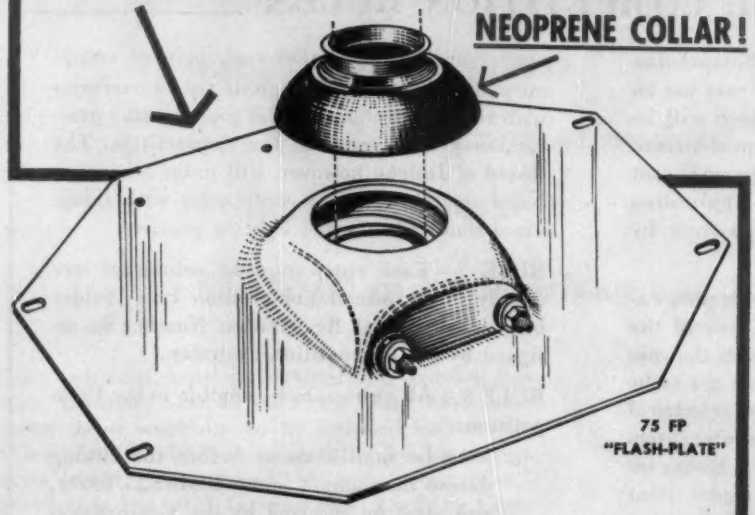
Company _____

Address _____

City _____ Zone ____ State _____

new

from Porcelain Products . . . combination roof-plate and flashing with NEOPRENE COLLAR!

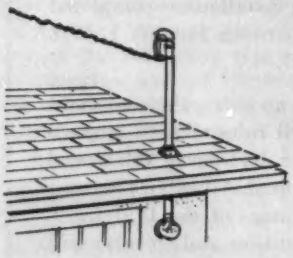


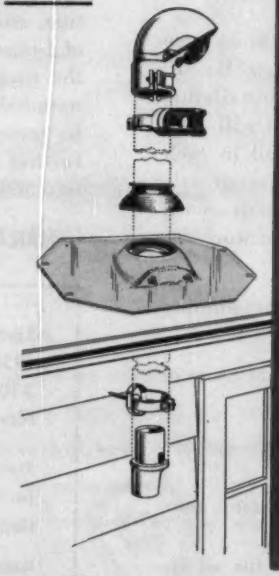
75 FP "FLASH-PLATE"

Makes installation

- QUICKER—fewer parts
- EASIER—no caulking

at Less Cost!





Now, Porcelain Products Mast Kits feature FLASH-PLATE, a combined roof-plate and flashing, plus a lifetime, watertight Neoprene collar. The "one-piece" feature makes Porcelain Products Mast Kits easier to install . . . provides a stronger, longer lasting, safer entrance mast . . . ALL AT *LESS* COST TO YOU!

Flash-plate is heavy, 14 gauge galvanized plate. It supports a 2" or 2½" mast on any roof, neatly and effectively, *with no caulking* needed. Write today for further information and free quantity of installation instructions.

ELECTRICAL PORCELAIN SINCE 1894

63 years

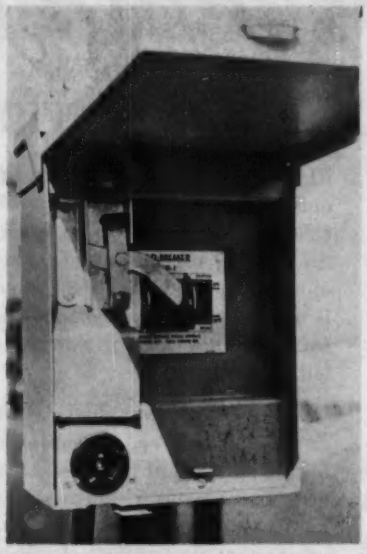
Porcelain Products, Inc.

PP INC

FINDLAY, OHIO

Link s Generator

(Continued from page 104)



SWITCH CLOSED for service from power company, metal plate covers outlet

farmer's generator is plugged in.

The switch when closed for service from the power company has a plate in the lower left-hand corner which covers the outlet for the generator connection. When the switch is open, the connection is exposed so that the generator can be plugged in.

In general arrangement of the pole serving the farm buildings, there are two conduits. One runs from the transformer secondary to the meter; the other from the switch to the services feeding the farm buildings. Service switch and meter are mounted back-to-back.

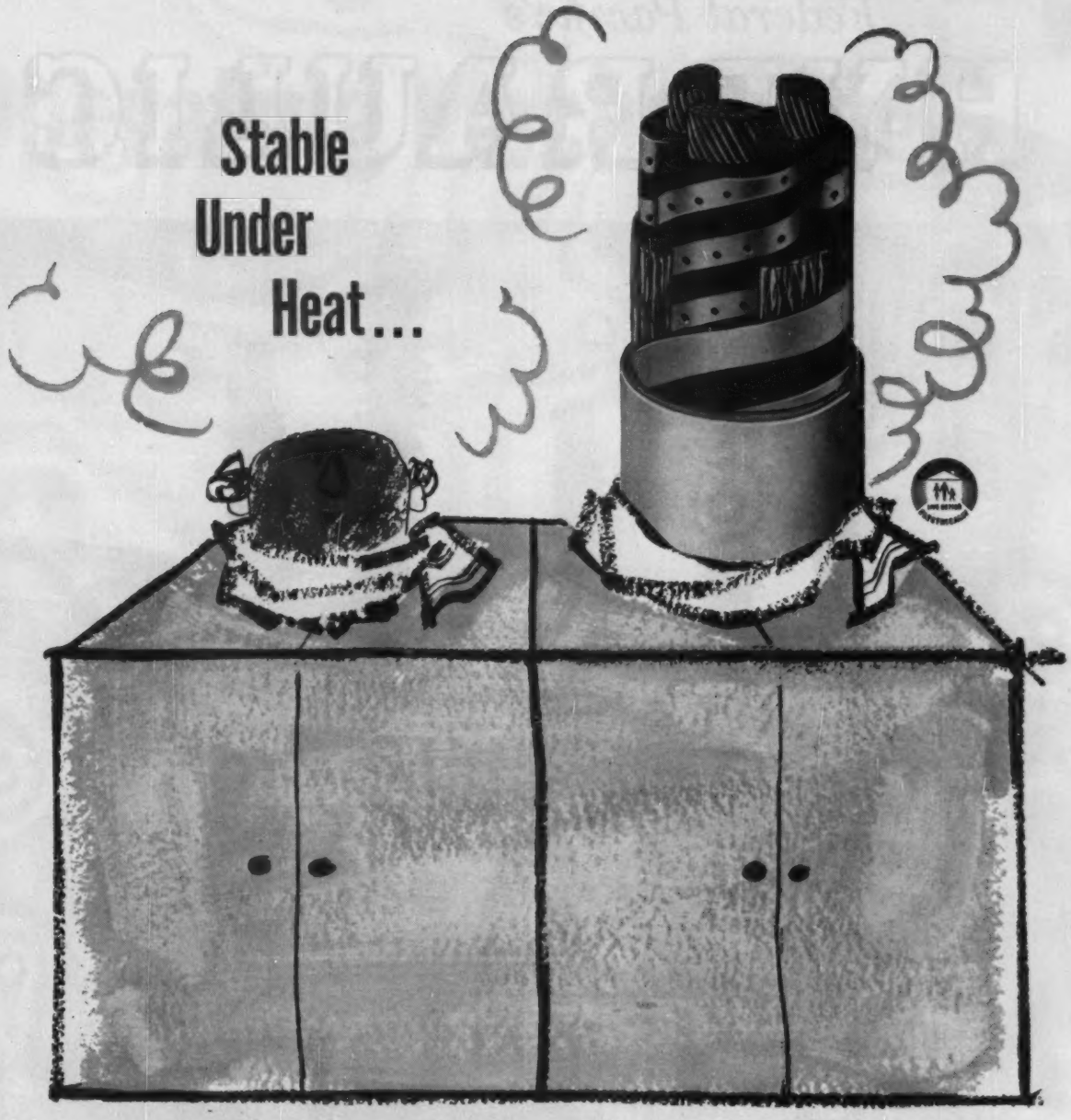
DISTRIBUTION—Maintenance

Simplify Locating Transformers

MOODY SMITH, Engineering Dept, Panhandle Division, Southwestern Public Service Co, Amarillo, Texas

Diagrams printed on installation order forms simplify the location of transformers on distribution location maps for Southwestern Public Service Co.

(Continued on page 112)



the Tellurium Lead-Alloy Sheath on Roebling Paper Power Cable

Sheath temperatures during wiping operations are in the range of 400°F, emphasizing the importance of heat stability. And you'll find that Roebling Tellurium Lead Alloy Cable Sheath retains its excellent creep resistance and bending fatigue resistance even after being subjected to this high temperature.

This is just one of the *extra-life* qualities built into Roebling Paper Power Cable with Tellurium Lead Alloy Sheath. Learn more about this exceptionally serviceable cable that offers so many savings. Write today for free, new, illustrated booklet that tells the whole story! Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
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Federal Pacific's

HYDRAULIC

Advantages of FEDERAL PACIFIC'S Type OA Operator

- Safe, Dependable Operation
- Quick Response
- Smooth, Shock-Free Performance
- Freedom From Corrosion
- Multiple Reclosings
- 100% Trip-Free Under all Conditions

For further details...write:

PACIFIC SWITCHGEAR DIVISION

5315 Third St., San Francisco, Calif.

Operating Mechanism

provides smooth, safe, dependable operation under all conditions!

A pioneer in the application of hydraulic principles for more efficient circuit breaker operation—Federal Pacific proved that quicker responsiveness could be obtained and smooth, shock-proof, dependable performance achieved through the use of a *Hydraulic* operating mechanism.

The type OA hydraulic operator, now standard equipment on most Federal Pacific Oil Circuit Breakers, climaxes an extensive development and improvement program in the use of hydraulics over a period of many years.

It is thoroughly tested and proved...and provides maximum freedom from operating trouble while insuring 100% trip-free performance under all conditions.

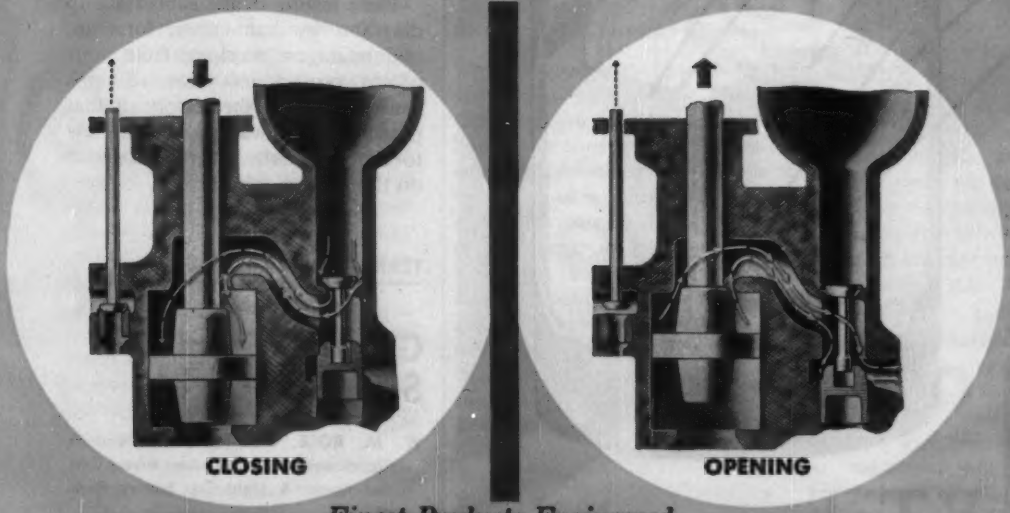
WHY HYDRAULICS ASSURE TOP PERFORMANCE

1. INELASTICITY OF HYDRAULIC FLUIDS PROVIDES INSTANT RESPONSE...the type OA operator, a closed hydraulic system, takes full advantage of this principle to provide immediate stopping or starting action. This permits rapid change in direction in breaker operation during a trip-free action.

2. HYDRAULIC COMPONENTS PERMIT PRECISE MOTION CONTROL...result in smooth performance. Hydraulic damping effect and dash pot action on both ends of the power piston stroke completely eliminate all overtravel. The ease with which opening and closing operations are effected marks a major design achievement.

3. HYDRAULIC FLUIDS ARE NON-CORROSIVE AND ANTI-SLUDGING...because of this, a long uninterrupted operating life without maintenance is assured. The closed hydraulic system prevents condensation, thus eliminating frequent servicing. As a result, complete safety and uniform operation is maintained...and maintenance minimized.

4. UNEQUALED TRIP-FREE ACTION UNDER ALL CONDITIONS...Hydraulic loading of trip latch permits trip-free performance throughout the entire closing operation and prevents latch chatter. Positive control between breaker and mechanism exists at all times.



Finest Products Engineered

FEDERAL PACIFIC ELECTRIC

COMPANY

Main Office: 50 Paris Street, Newark 1, N. J.

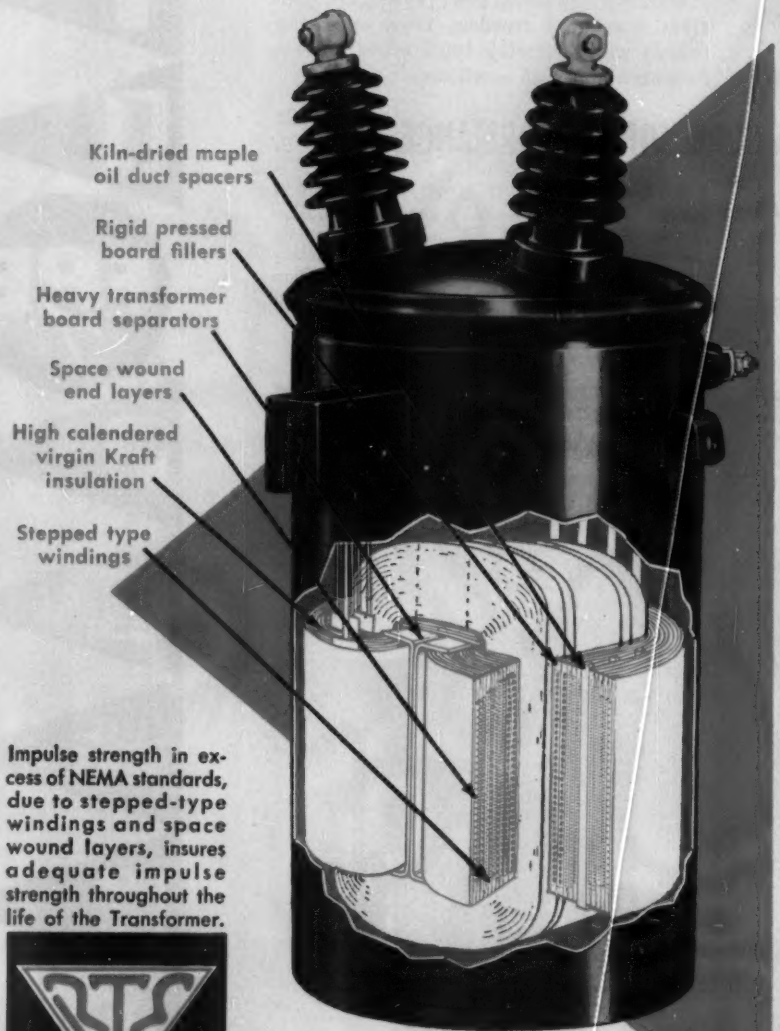
Plants at Newark, N. J.; Long Island City, N. Y.; Cleveland, Ohio; St. Louis, Mo.; Dallas County, Texas; Scranton, Pa.; Los Angeles, Calif.; San Francisco, Calif.; Santa Clara, Calif.; Emeryville, Calif.; Affiliated Plant, Toronto, Canada.

What Makes RT&E Transformers Better?

OUTSTANDING COIL DESIGN

High Overload Capacity
High Impulse Strength

RT&E core-type construction, combining maximum cooling surfaces with careful placement of oil ducts at critical points, results in faster cooling and a greater-than-average overload capacity. Mechanical strength of coils is enhanced with top quality varnish impregnation.


Kiln-dried maple oil duct spacers
Rigid pressed board fillers
Heavy transformer board separators
Space wound end layers
High calendered virgin Kraft insulation
Stepped type windings

Impulse strength in excess of NEMA standards, due to stepped-type windings and space wound layers, insures adequate impulse strength throughout the life of the Transformer.

RT&E CORPORATION
WAUKESHA, WISCONSIN

OUTSTANDING COIL DESIGN — *Another reason why* **RT&E** *is better!*

Locates Transformers

(Continued from page 108)

The diagrams cover most situations encountered in installing or removing transformers, and eleminate confusion that may follow from the marking of a transformer location on a free-hand sketch.

Two diagrams are printed on the reverse side of Public Service's transformer order form. One represents a few blocks in an urban area; the other, a section of rural land. Curving streets, irregular surveys, and other characteristics of an area may be indicated with some slight additional drawing around the edge of the diagram. To complete the diagram, streets, roads or surveys are labeled.

Stamp Formerly Used

Printed diagrams evolved from the use by line crews of two rubber stamps for marking clearly the site of a transformer. The stamp was used on the back of the order form following installation.

A copy of this form, prepared in duplicate when the transformer was ordered to be installed, went to the division engineering department following installation work. From the site noted on the diagram, the engineering department revised the location map. Before the use use of the stamps, it was difficult at times to determine the correct location of a transformer from a sketch.

Field testing of the rubber stamp diagrams by line crews, foreman, and managers working from four offices proved its value. Stamps were used until the supply of that particular form was exhausted. New forms have both diagrams printed on the reverse side.

TRANSMISSION—Construction

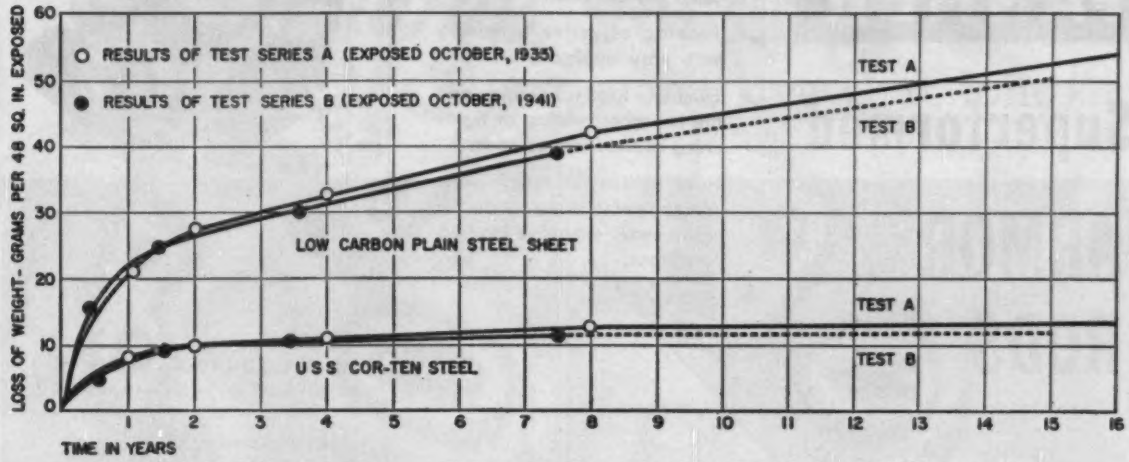
Gasoline Pump Speeds Splicing

W. M. ROSE, General Superintendent, Transmission & Distribution, Jersey Central Power & Light Co, Asbury Park, N. J.

A gasoline-driven hydraulic pump

(Continued on page 114)

This chart shows time-corrosion curves of two separate tests. During the last 8 years of test A, begun in 1935, the carbon steel corroded at least 8 times more than the COR-TEN Steel. Note that test B, begun in 1941 at the same industrial location, follows almost the exact curve of the earlier test. Other test data warrant extrapolation of test B to 16 years based on the straight line corrosion typical of COR-TEN Steel.


LOSS OF WEIGHT - GRAMS PER 48 SQ. IN. EXPOSED
TIME IN YEARS
O RESULTS OF TEST SERIES A (EXPOSED OCTOBER, 1935)
● RESULTS OF TEST SERIES B (EXPOSED OCTOBER, 1941)
TEST A
TEST B
LOW CARBON PLAIN STEEL SHEET
USS COR-TEN STEEL
TEST A
TEST B

Graph—Examples of time-corrosion curves of structural carbon steel and COR-TEN Steel in an industrial atmosphere.

How Atmospheric Corrosion-Resistant USS COR-TEN Steel Cuts Replacement Cost of Pole Line Hardware

- **COR-TEN Steel's Atmospheric Corrosion Resistance is 4 to 6 times that of carbon steel.**
- **Anticipated Life of COR-TEN Steel Pole Line Hardware is equal to life of a treated pole.**

To understand why and how USS COR-TEN Steel cuts pole line hardware replacement costs, you need only consider why pole line hardware needs replacement at all. Conventional hardware made of galvanized carbon steel has adequate strength to begin with. However, when the protective coating is gone, the base metal beneath is exposed to the elements. Gradually, through the ravages of atmospheric corrosion, the hardware literally *loses weight*—and therefore *strength*—to the point of physical failure. How long it will retain sufficient strength to do its job safely depends, of course, upon the atmospheric conditions in the locality. Deterioration will normally be more rapid in a marine or industrial atmosphere than in a rural area. All too often, hardware must be replaced while the treated pole supporting it is still good for many more years of service.

The answer to this problem is obvious—find an *economical* material that has greater resistance to corrosion. That material is available in USS COR-TEN High-Strength Low-Alloy Steel. Not only does it have greater strength than carbon steel, but because of its superior resistance to atmospheric corrosion, COR-TEN Steel Pole Line Hardware should last as long as the treated pole that supports it.

Atmospheric Corrosion Resistance

While its greater strength—50% high yield point—is a definite asset, USS COR-TEN's greatest advantage over carbon steel in hardware applications is its superior resistance to atmospheric corrosion—4 to 6 times that of carbon steel. The reason? Simply this: when first subjected to the elements, COR-TEN Steel forms a smooth, *tightly adhering* coat of oxide scale. This coating, unlike that on carbon steel, clings so tightly to the metal that it tends to shut out the elements, acting as a barrier against progressive attack on the steel beneath and effectively slowing down further corrosion.

A New Practice

Hardware made with COR-TEN Steel is a relatively new idea. Frankly, it will be several years before the convictions of the first users of COR-TEN Steel hardware will be borne out. However, USS COR-TEN Steel in dozens of other applications time and again has proved its far superior resistance to atmospheric corrosion. COR-TEN Steel railway hopper cars, in addition to constant exposure—as in the case of pole line hardware—are subjected to the pounding and abrasion of millions of tons of coal and coke. Under these conditions, far more severe than pole line hardware has to face, COR-TEN Steel cars are still in service after more than twenty years of continuous use.

That is why we firmly believe that with USS COR-TEN High-Strength Steel, you will be able to install hardware on a new, pressure-creosoted pole and erase the entire installation from your maintenance budget for as long as the pole is in service. The savings on such superior service we leave to your own slide rule.

Although United States Steel is not a manufacturer of pole line hardware, we produce USS COR-TEN *for* hardware. If you would like the names of companies making hardware with USS COR-TEN Steel, or if you would like additional information on corrosion-resistant hardware, we will gladly send our book, *"USS COR-TEN Steel Pole Line Hardware."* Just write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

FANNER

Superformed ARMOR RODS

- Have low installed cost.
- May be removed and reapplied without loss.
- Provide effective armoring with easy application.
- Eliminate field fabrication and the improper twisting or tightening of field-formed rods.
- Have built-in full length gripping power to share conductor strain under excessive loading conditions.
- Serve as an excellent conductor repair medium (for broken wires).
- Eliminate trouble caused by loosened end-clamps.
- Eliminate conductor wear in insulator grooves or in suspension clamps.
- Adapt easily to hot-line application.
- Permit direct tapping and eliminate conductor damage due to burning, over-tightening, or clamp loosening.
- Eliminate conductor pitting due to power currents attending flash-overs.
- Minimize corona formation, by eliminating irregularly shaped clamps or clips.

do **SO MUCH** for **SO LITTLE**

A FANNER EXCLUSIVE:

Packed in sturdy cartons. Armor Rod ends are color coded for easy identification of sizes up through 4/0. Write for convenient color code chart.

Licensed for use under patent No. 2,275,019

THE FANNER MANUFACTURING COMPANY

Electrical Products Division

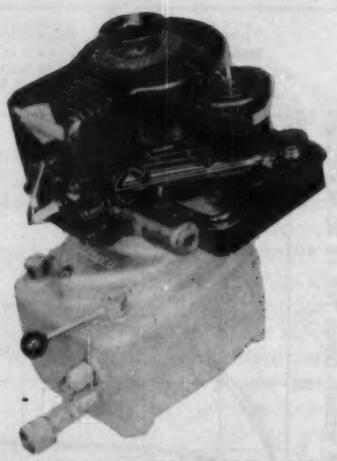
BROOKSIDE PARK • *Established 1894* • CLEVELAND 9, OHIO

Telephone: SHadyside 1-6000

Fine Fanner Superformed

AGENTS and DISTRIBUTORS IN PRINCIPAL CITIES

Lineguards • Top Armor • Patch Rods • Fanngrips • Plastic Fanngards



COMPRESSION TOOL with different hose length used on poles and towers

proved economical and practicable for empowering the compression tool for splicing conductors during the construction of Jersey Central Power & Light Co's 115-kv transmission line between Raritan River Substation and the new Larrabee substation. This method helped to overcome adverse field conditions, and its use will be continued and expanded—according to present plans—in the company's future construction operations.

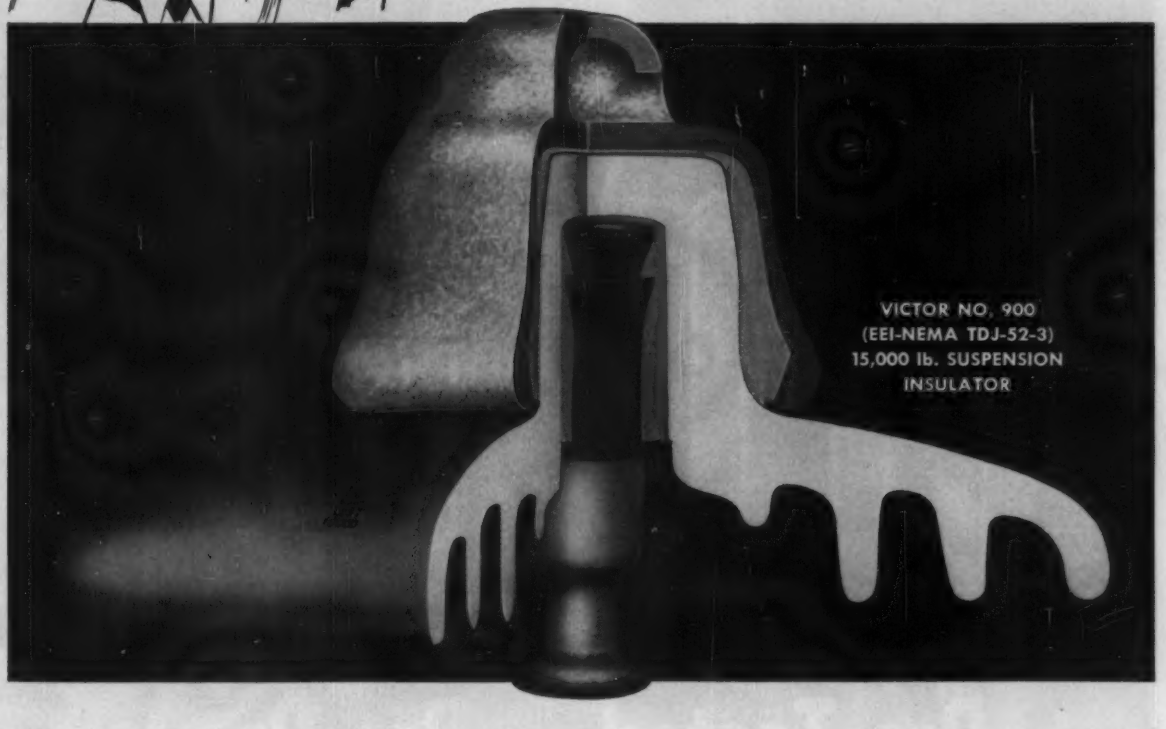
The pump was operated by a 1½-hp, 4-cycle motor, which weighs 55 lb. This pump is coupled to an installing head by means of a hydraulic hose. A 25-ft hose permitted the pump to be mounted on a jeep during the making of most splices on the ground. During overhead splicing, a 75-ft hydraulic hose allowed the pump to remain on the ground. As the pump is relatively light in weight, it could be raised up the poles and towers for the installation of jumper loop splices.

There are 302 full-tension and 70 jumper loop splices on the two 795-MCM ACSR conductor lines. Use of the gasoline pump for splicing compared with use of a hand or electric pump as follows:

Hand—40 min per splice.
Electric—15 min per splice
Gasoline—12 min per splice

Another advantage of the gasoline pump lies in the fact that, unlike the electric pump, it doesn't need a generator set and thus effects a considerable saving in purchase prices, maintenance cost, and handling of an additional piece of equipment.

"I'll never replace VICTOR SUSPENSIONS... I just won't live that long!"



Men who purchase insulators are enthusiastic about the service records of VICTOR Suspensions. That's because VICTOR Suspensions are laboratory designed, manufactured under rigid quality controls and tested with the industry's most modern equipment.

Take the No. 900 Insulator shown above, for example. It has rugged, rounded corrugations for maximum strength and resistance to impact. Cap and ball bolt are thick, husky and galvanized to withstand severe service. Scientifically fitted glaze gives added strength and added protection against contamination. Each insulator is proof-tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover tests. When you buy VICTOR, you just can't buy better suspensions!

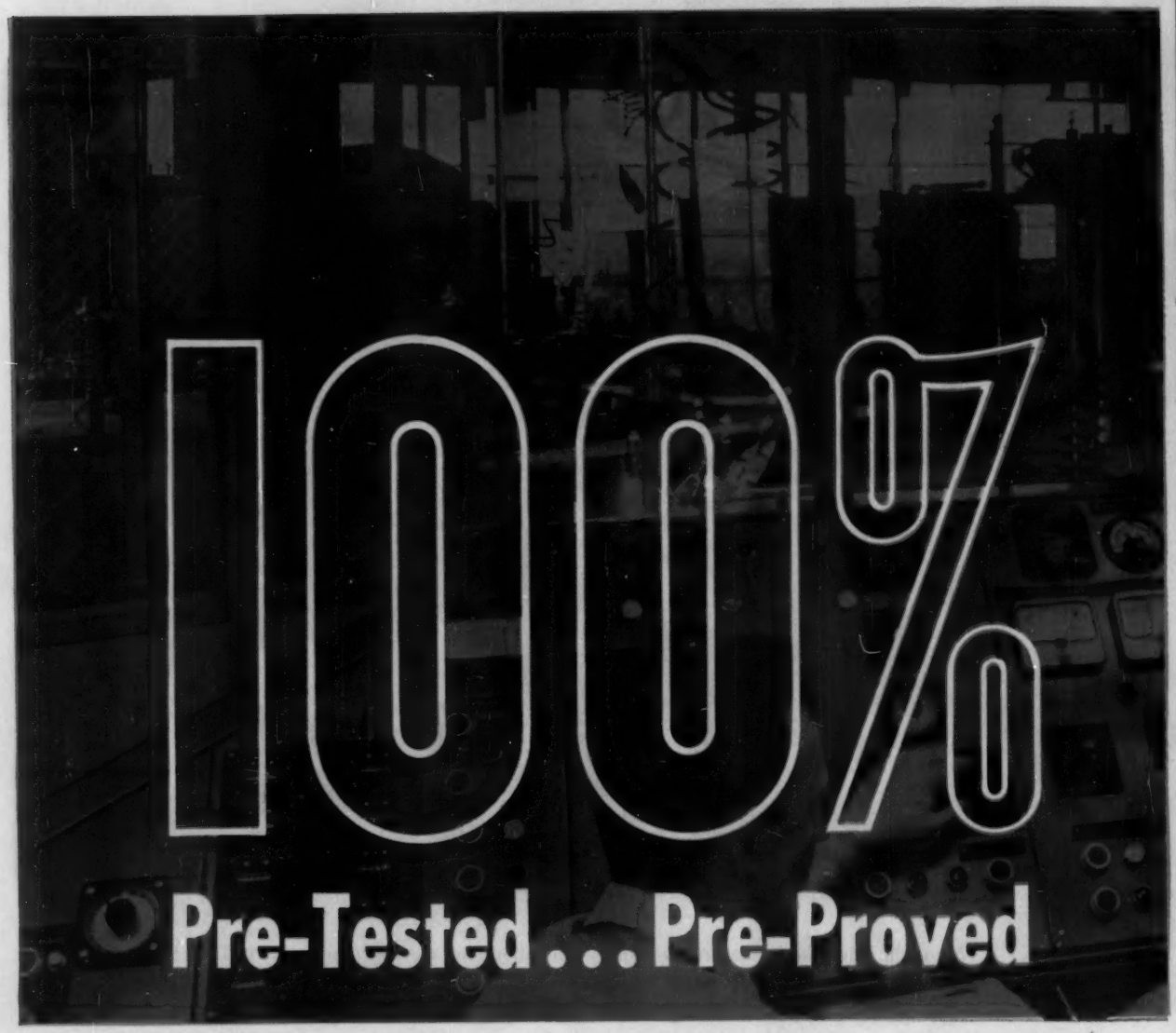
New.....

VICTOR CATALOG

Now ready for distribution is Victor's newest and most extensive catalog. One of the most complete in the field, it includes illustrations and data on many items being produced at VICTOR and not previously shown, up-to-date EEI-NEMA Standards, and an outline of VICTOR'S new plant, research, testing and manufacturing facilities. It's FREE! Write for *your* copy.

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC.
VICTOR, N. Y.



Patent Applied For

Moloney HyperCore Distribution Transformers

Each and every HyperCore Distribution Transformer shipped from Moloney's new, enlarged, streamlined facilities will perform, without exception, as NEMA Standards prescribe! Elaborate test facilities maintained by many utilities are now unnecessary for HyperCore Transformers, because this new manufacturing system eliminates any possibility of shipment of sub-standard transformers. Case histories of *each* individual transformer are kept and *each* transformer must measure up to NEMA Standards and Moloney's own high standards before it can be crated for shipment.

For example—When final assembly is completed, the automatic test system takes over. *Every* transformer must pass the following tests: Copper Loss Test • Ratio Test • Impulse Test • Induced Potential Test • Applied Potential Test • Core Loss Test • Sound Test • CSP Breaker Test (when applicable) • Leak Test.

All these vital tests are made *automatically* by remote control from the master control room. It is impossible for the human element to influence tests.

MOLONEY ELECTRIC COMPANY

Automatic spotting devices mark any sub-standard transformer not meeting Moloney's high standards, and direct it into a reject line, where it is removed and examined to determine the reason for failure.

Thus, any HyperCore Transformer that is shipped, *automatically* performs as you, the utility, and we, the manufacturer, want it to perform.

Increased production facilities, plus positive quality control, plus the Moloney network of warehousing facilities, make available the best product . . . at the time you need it. Immediate shipment from stock can be made from a point near you. Check with your Moloney man today.

ME87-6

HyperCore Transformers are available from stock in all Standard Ratings in both Conventional and CSP designs.

MOLONEY ELECTRIC

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Stores go from black to . . .

white, and load is tripled as . . .

IPCO Sells Lighting to 'Target' Stores

Interstate Power Co, Dubuque, Iowa, has been getting pretty good results with its commercial lighting program. What IPCO has done is select "target" stores in which to boost the lighting load. These stores are in towns that have been more or less neglected in regard to commercial lighting efforts.

To stimulate interest a competition among the company's ten operating districts was organized. In nine of the ten districts four stores were chosen from four different towns. These "target" stores were not in the larger towns where the district headquarters were located. A target store bulletin was published each month to whet the competition.

Once the stores were selected, they could not be changed (for competition purposes). To qualify as a sale, the IPCO salesman had to add or replace at least four fixtures in a store. While this sounds like very few, many of the target stores were small.

Results to date have been impressive:

- Lighting jobs were sold in 16 of the 36 stores.
- Average lighting load was more than tripled—from 13 kw to 45 kw.
- One district sold all four of its target stores. The promotion is being kept up; IPCO would like to put new and better lighting in all 36 target stores.

The object of the contest was to set a store lighting pattern in the community, and apparently it worked. Experience has been that when one store lights up, its competitors are forced to follow suit.

PG&E 'Lights the Way' to Bigger Load

Pacific Gas & Electric Co and three manufacturers are cooperating in San Francisco in trial installations of several types of street lights. Public reaction to the test installations will help the city decide what units to use in $200,000 street lighting modernization program.

Incandescent lights on Market Street, the city's main thoroughfare, and the downtown Triangle district will be replaced with fluorescent and mercury units. Lighting in both areas now measures about 0.5 ft-candles. The city wants to boost it to 1.8 on Market Street and 1.5 in the Triangle.

With PG&E, General Electric, Westinghouse and Line Material Co participating, five trial installations have been completed. Three more are scheduled. Most extensive one is in a six-block strip where 30 four-tube fluorescent units will be tested.

Under study to the three as successors to the three-lamp incandescent units on Market Street are (1) a 12-tube fluorescent unit and (2) a unit housing a single mercury bulb. For the Triangle, which now has two-light units, the city is considering a (1) one-lamp mercury unit and (2) four-tube fluorescent job.

PG&E will foot the bill for replacing lights and poles in the triangle district, because it owns the fixtures. Some 200 Market Street fixtures, owned jointly by the city and PG&E, will be modernized at the city's expense.

The program, if public reaction is good, can't help but boost the utility's lighting load, and leads the way to upgraded street lighting, with all its attendant benefits.

Mercury At Olympia

A $200,000 street lighting program is the result of action of the citizens in Olympia, capital of the State of Washington. New mercury vapor luminaires grace the streets in the business district, the state capitol area, and some of the highways leading downtown.

(More Selling on page 127)

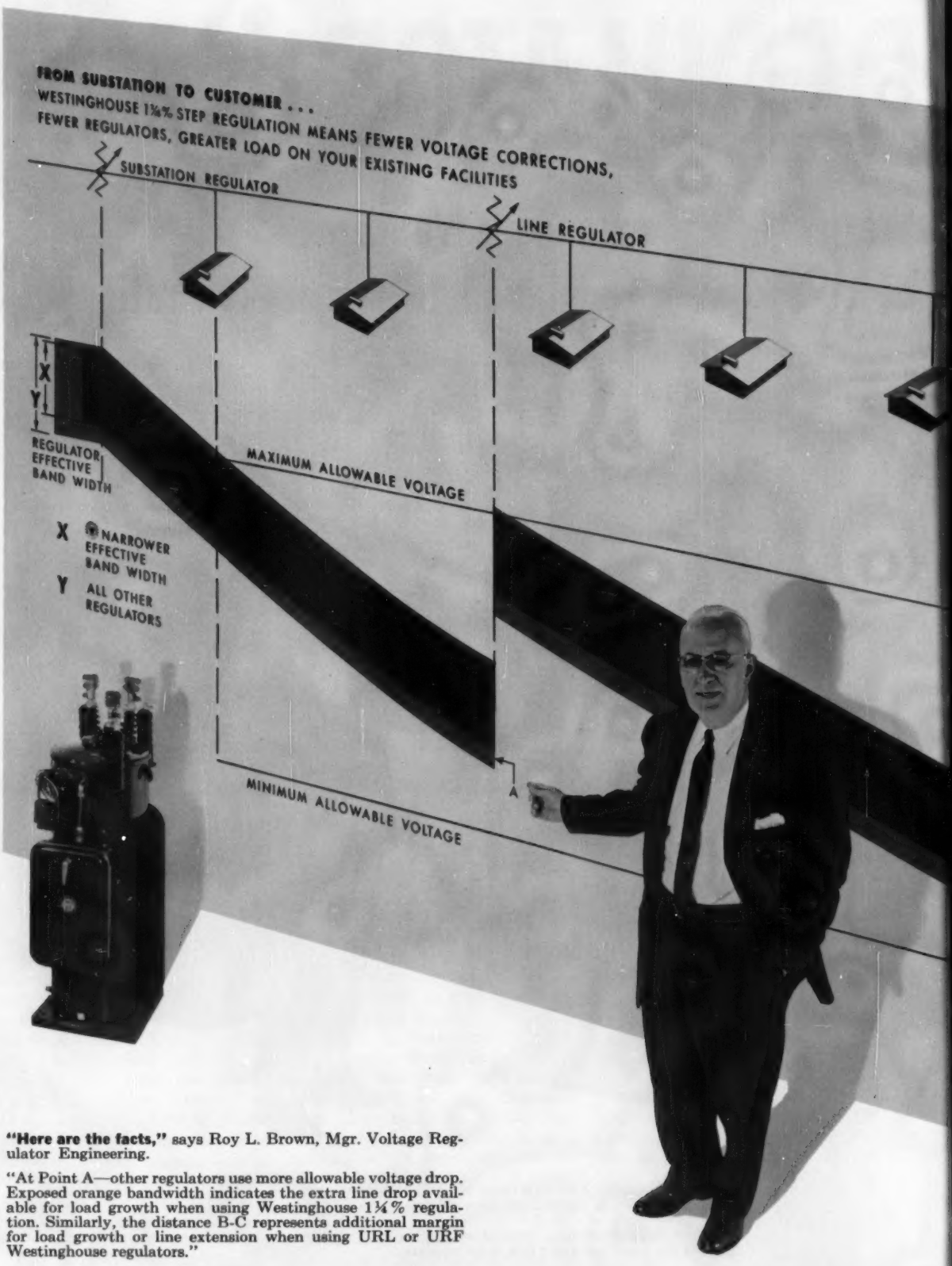
REGULATOR NEWS

Westinghouse extends advantages of 1¼% step regulation to higher kva ratings

Left—URF regulator extends range of 1¼% step regulation . . . reduces your initial investment for regulators up to 167 kva.

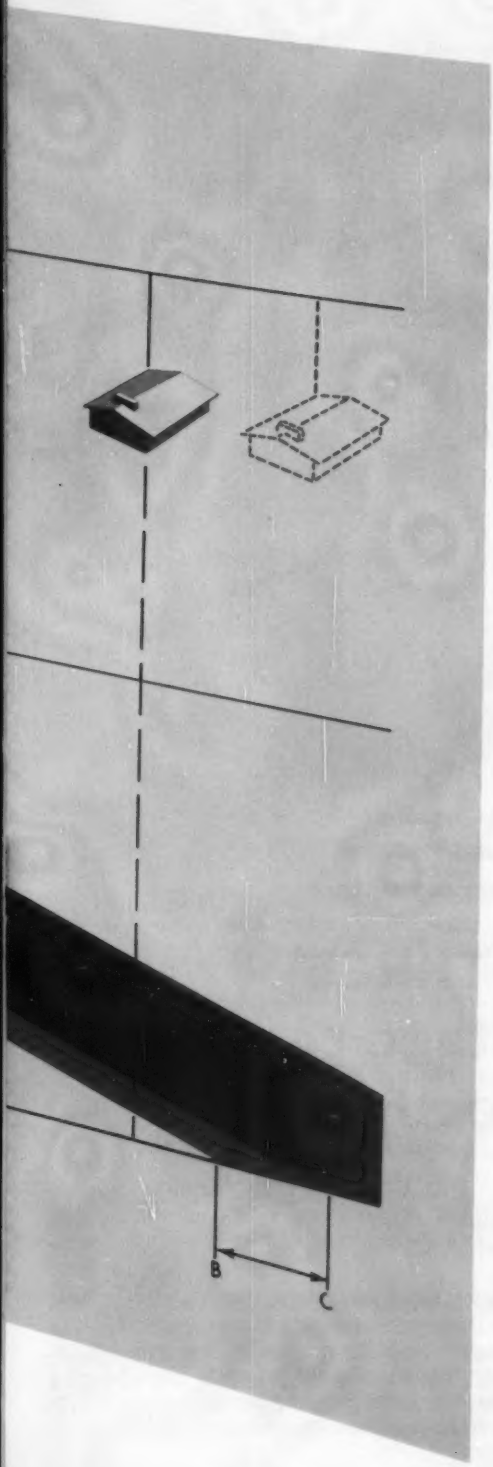
Right—URL regulator . . . over 10 years of field experience has proved the superiority of 1¼% step regulation.

YOU CAN BE **SURE**... IF IT'S Westinghouse



"Here are the facts," says Roy L. Brown, Mgr. Voltage Regulator Engineering.

"At Point A—other regulators use more allowable voltage drop. Exposed orange bandwidth indicates the extra line drop available for load growth when using Westinghouse 1¼% regulation. Similarly, the distance B-C represents additional margin for load growth or line extension when using URL or URF Westinghouse regulators."



It's a fact . . .
Westinghouse 1-1/4% step regulation

holds narrowest effective bandwidth, gives you more revenue

Westinghouse 1-1/4% step regulation more effectively meets the three basic distribution voltage conditions — you gain a narrower effective bandwidth; permits heavier loads, less line equipment.

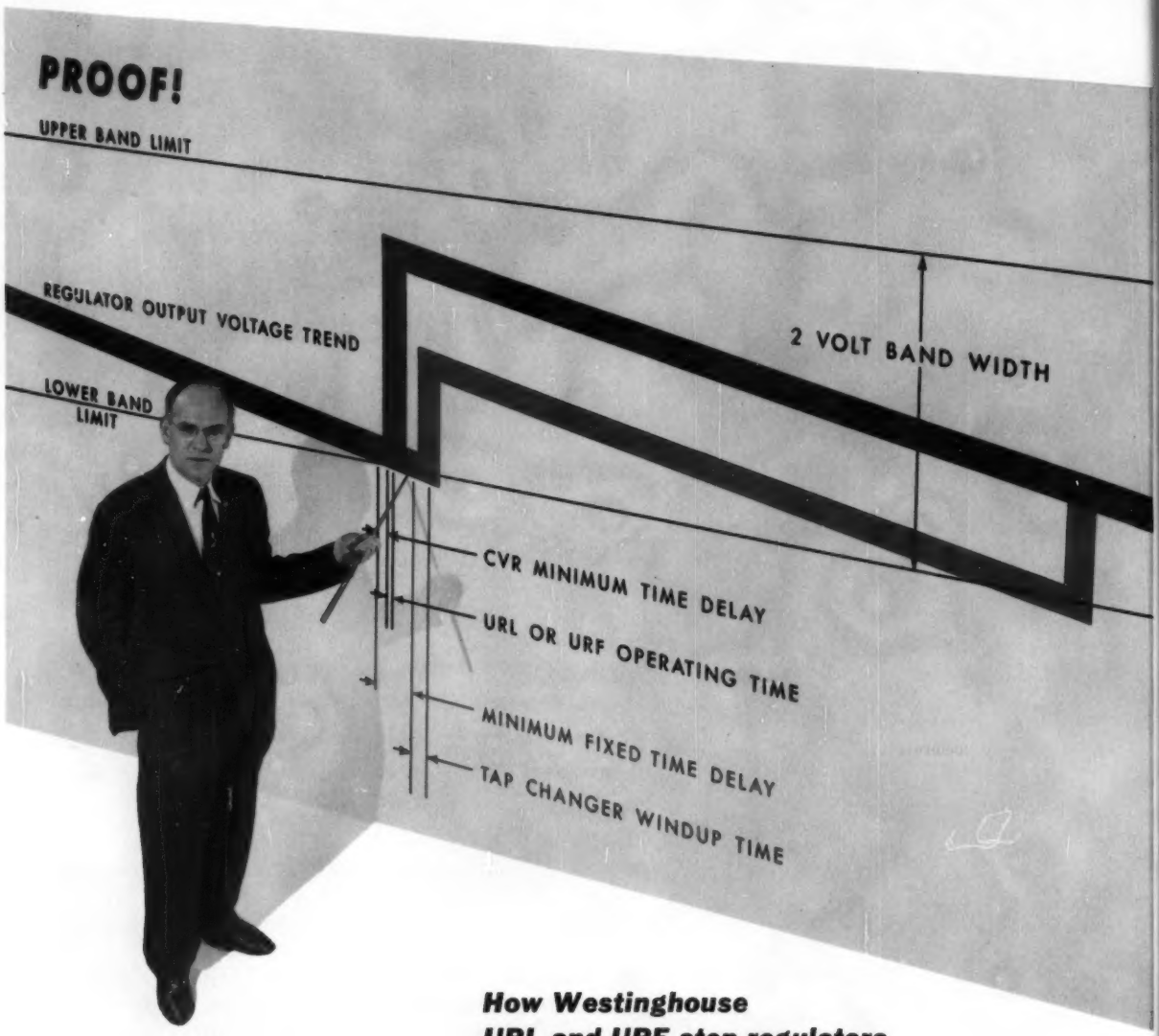
Here is what Westinghouse new URL and URF step voltage regulators can do for you:

1. Save you money because satisfactory voltages can be furnished to loads farther out on the line.
2. Increase revenue by allowing heavier loading of existing lines, hold effective regulator voltage bandwidth closer to the limits set on the control.
3. Because of faster relay operation on large voltage changes and a tap changer that responds 15 times faster than other types of mechanisms, URL and URF regulators provide protection against runaway voltages which can damage user equipment.
4. Make possible a minimum total regulation equipment investment:
   (a) Longer lines
   (b) Fewer regulators
   (c) Deferred expansion to meet growing loads

YOU CAN BE SURE...IF IT'S Westinghouse

This is system operating flexibility you get with no other regulators

HERE'S WHY . . .



How Westinghouse URL and URF step regulators

meet all THREE basic voltage conditions more effectively

SMOOTH VOLTAGE CHANGES

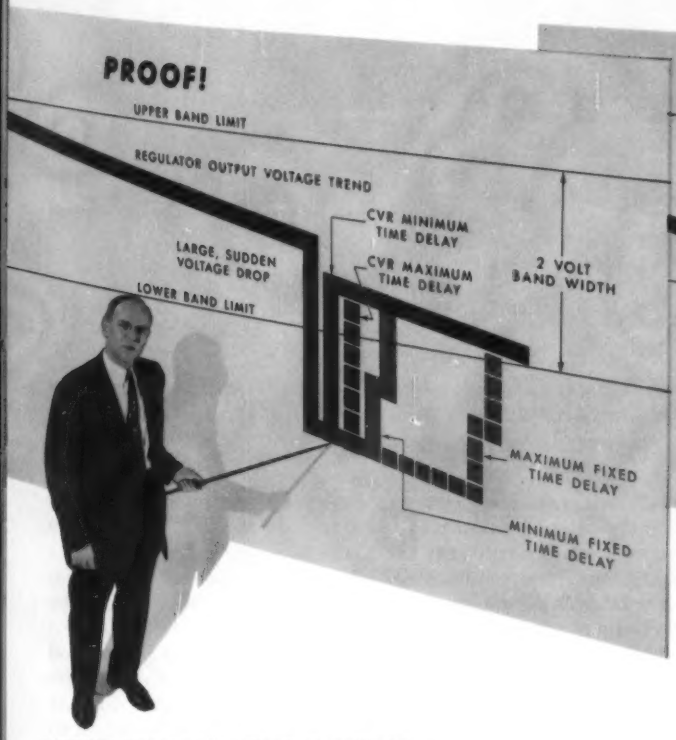
Fixed time delay on ordinary regulators allows voltage to go outside band limit before operation. The Westinghouse CVR induction disc relay "reads" voltage. When lower or upper band limit is reached, contacts close; instant-response tap changer corrects voltage 15 times faster than other tap changers.

RESULT . . .
A NARROWER EFFECTIVE BANDWIDTH

THE PURPOSE OF A REGULATOR is to maintain an effective voltage level which will provide top operating revenue consistent with the least possible equipment investment and minimum maintenance.

THREE EXCLUSIVE WESTINGHOUSE REGULATOR FEATURES give you this optimum voltage correction. (1) The unique new CVR voltage regulating relay with integral, adjustable, inverse time delay; (2) the instant-response tap changing mechanism, and (3) the 1¼% step giving regulation on a 120-volt base of 24 volts in 16 steps of 1½ volts each.

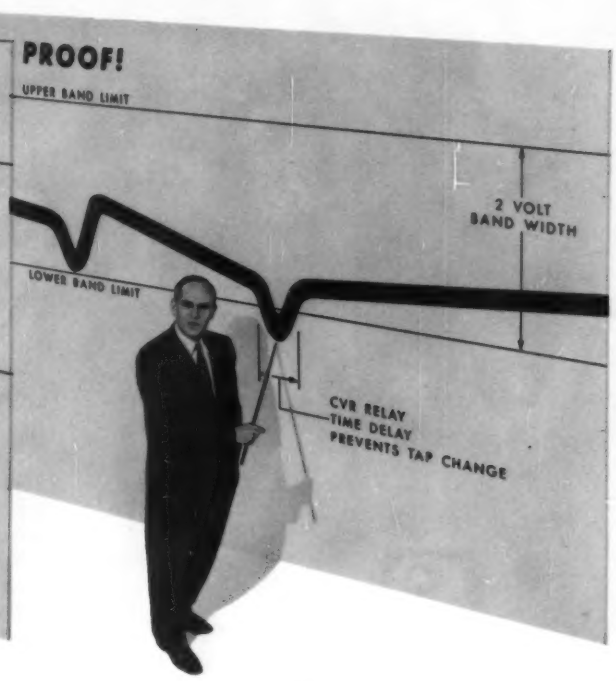
YOU CAN BE SURE... IF IT'S



LARGE, RAPID VOLTAGE CHANGES

CVR relay disc accelerates to close contacts and operate instant-response tap changer in a fraction of the time taken by other regulators. Because of the fixed time delay of ordinary regulators, steep voltage changes may run voltage so far above or below set band limits that two or more ¾-volt steps are required to bring voltage within the band. Westinghouse regulators, however, offer the quickest recovery under such voltage conditions.

RESULT . . .
A NARROWER EFFECTIVE BANDWIDTH



IRREGULAR VOLTAGE CHANGES

Westinghouse CVR relay induction disc with its damping magnet integrates voltage and time; its inverse time delay characteristic prevents relay and tap changer operation during self-correcting conditions.

RESULT . . .
NO UNNECESSARY OPERATIONS

New CVR relay "reads" voltage, evaluates need for correction, eliminates unnecessary tap changes

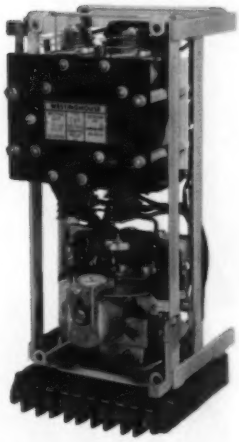
CVR voltage regulating relay is an induction disc device with built-in inverse time delay characteristics. On a smooth, slow-changing voltage (Figure 1), the disc position will follow the voltage, and will close contacts to start corrective action by the tap changer whenever voltage reaches pre-set band limits.

Ordinary regulators with fixed time delay allow wider voltage deviations from set limit.

But in the Westinghouse URL and URF regulators, the CVR relay operates immediately . . . voltage is restored to within band limits. Result—narrower *effective* bandwidth.

On large, rapid voltage changes, such as may result from switching in other parts of the system or from rapid load changes (Figure 2), the CVR relay disc *accelerates*—contacts are made, and again corrective action by the tap changer starts immediately. Voltage is quickly restored to normal. Result—narrower *effective* bandwidth.

Finally, irregular voltage changes (Figure 3), such as result from motor starting, are usually short-time, self-correcting disturbances. The Westinghouse CVR relay disc integrates voltages—automatically provides time delay through the averaging effect of the damping magnet. Prevents unnecessary operations which would lead only to increased maintenance.



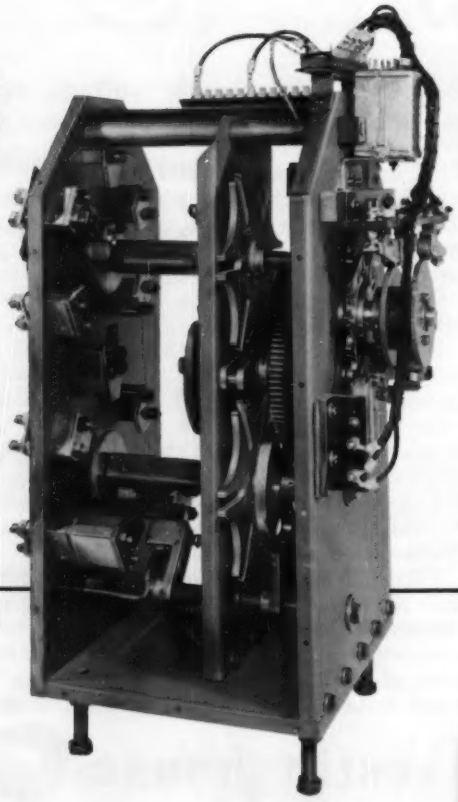
Unique new Westinghouse CVR relay with inverse time delay characteristics . . . provides best voltage regulation available under all voltage change conditions.

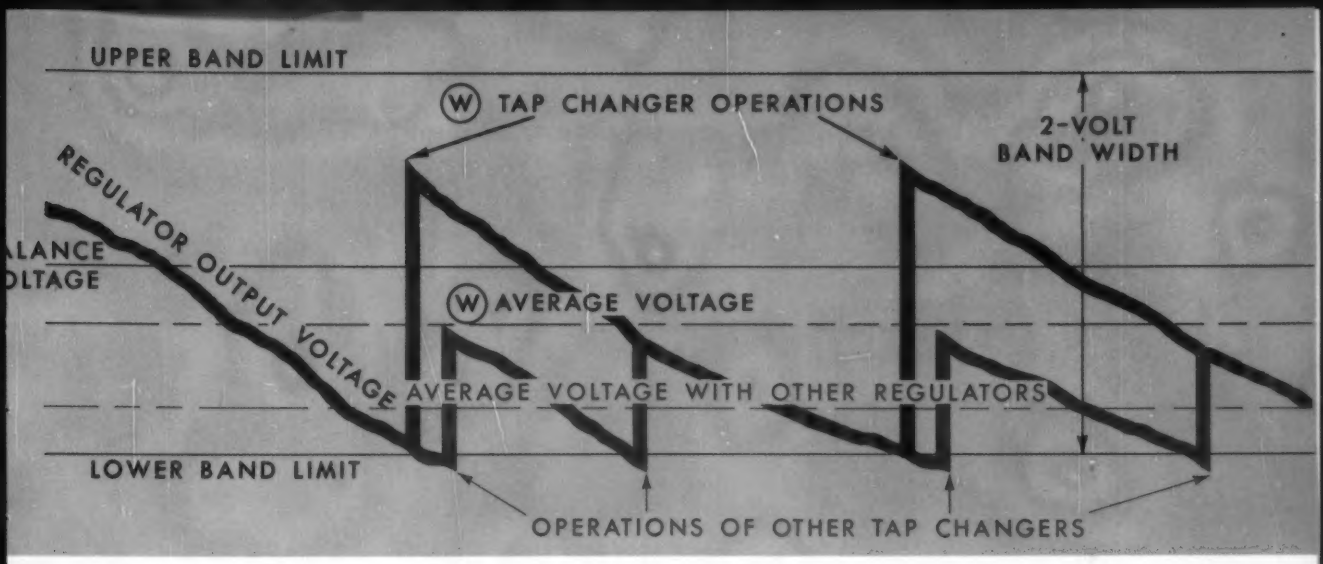
Westinghouse

Instant-response tap changer corrects voltage . . . 15 times faster than other tap changers

How Westinghouse direct-drive Geneva gear tap changer and CVR relay work together to achieve narrowest effective bandwidth

The *direct-drive Geneva gear* tap-changing mechanism responds instantly to the command of the voltage regulating relay. As soon as the relay contacts close, the tap changer motor starts driving the Geneva pinion. No windup time is involved. The pinion engages the Geneva gear and immediately moves the tap changer contacts to the next position. The advantages of directly driving the Geneva gear are dramatically illustrated in a comparison of time required for Westinghouse regulators to traverse from maximum raise to maximum lower with that of other regulators. The directly driven Geneva gear can, if so directed by the CVR relay, operate the tap changer over full range in only 13 seconds. Other drives require 3½ to 5 minutes from maximum raise to maximum lower. The elimination of this unnecessary time delay further contributes to A NARROWER *EFFECTIVE* BANDWIDTH.





Effective voltage of 16-step regulation is closer to balance voltage . . . with fewer operations

When a 2-volt bandwidth is used, the voltage level will always be more than one volt from the balance voltage when the relay initiates a tap change. With its 1½-volt steps, the Westinghouse URL and URF tap changers will bring voltage back to the balance level with a single operation; whereas, a ¾-volt step regulator will never bring voltage back to this level.

Westinghouse 16-step regulation means . . . 42% fewer operations, 15% less contact erosion. Result? Reduced maintenance, longer life

Optimum contact speed minimizes burning

Contact speed and burning are directly related—excessive burning of contacts will occur with either too slow or too rapid contact break. The former delays arc extinction, the latter frequently causes flashover between stationary contacts. Exclusive Westinghouse direct-drive Geneva gear mechanism consistently assures optimum speed. Arc extinction is achieved at first current zero. Flashover is eliminated, burning minimized, contact life significantly lengthened.

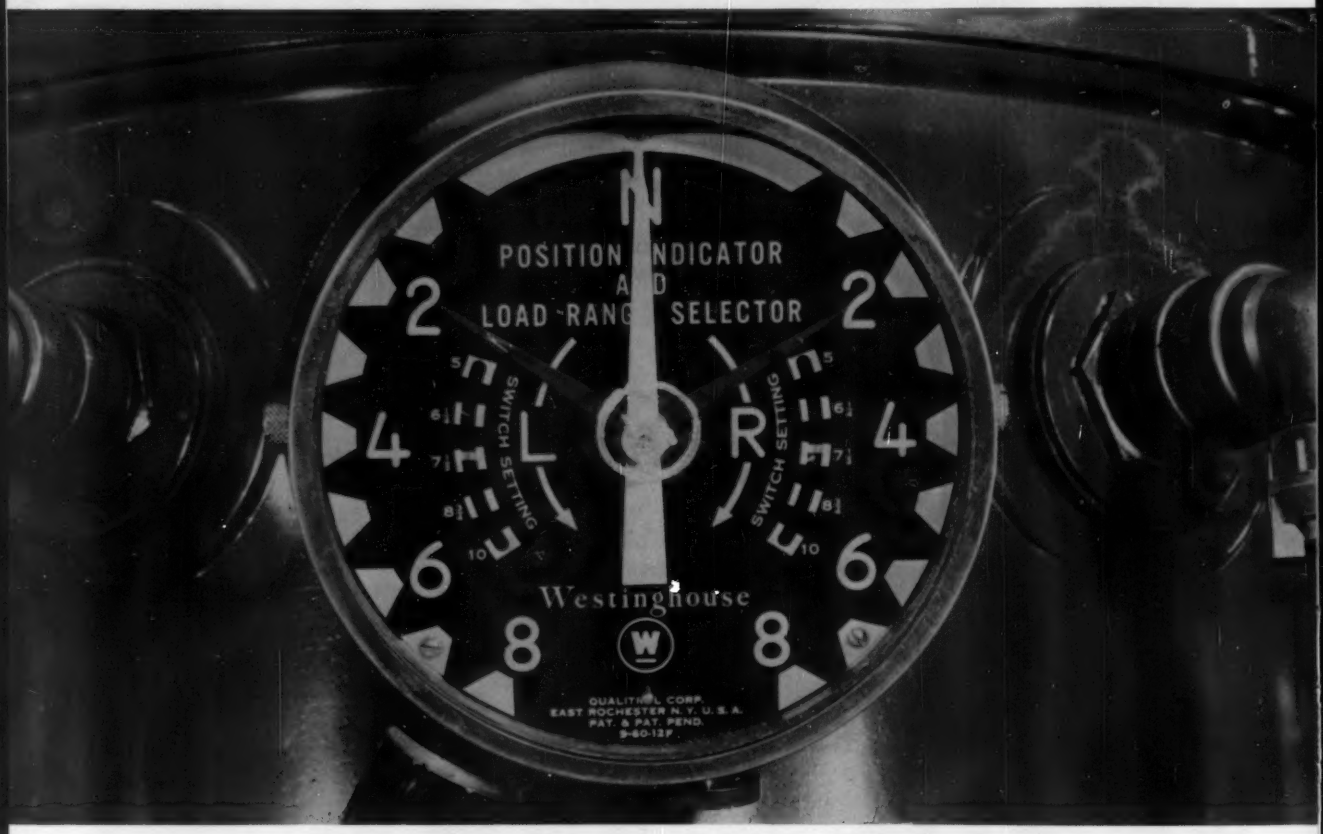
Contact burning and frequency of operation

Contact burning or erosion does not increase directly as the size of the step; therefore, the contact burning for one 1½-volt step is less than for two ¾-volt steps. Tests have shown that, on the average, the 16-step tap changer makes 42% fewer operations than a 32-step tap changer, and that the 16-step contacts average 15% less erosion for the same service. These two factors make 16-step operation result in reduced maintenance and longer life.

YOU CAN BE SURE...IF IT'S Westinghouse

Here is what new Westinghouse URL and URF regulators do for you:

- Hold a narrower *effective* bandwidth
- Provide protection against runaway voltages which can damage user equipment
- Increase revenue by permitting heavier loading of existing lines
- Save you money because satisfactory voltages can be furnished to loads farther out on the line



ADD TO THIS THE WESTINGHOUSE LOAD RANGE SELECTOR . . . allows higher currents at reduced range operation. With LRS, you get increased capacity on all URL-URF regulators . . . 160% of rated current at plus or minus 5% regulation up to 400 amperes.

Only Westinghouse offers these moneysaving product features:

- Separate tap changer compartment
- Inverse time delay relay
- Direct-drive Geneva gear tap changing mechanism
- 42% fewer tap changer operations
- Longer life contacts
- Corrosion-resistant tank

Get more revenue for power delivered. Specify new Westinghouse URL-URF regulators on your system.

J-70804

YOU CAN BE SURE... IF IT'S Westinghouse

Electromode Photo

STOREROOM was added to Equity Lumber Co's new building with first-cost savings when company put in electric heat, eliminating basement gas furnace room

Electric Heat Bonus: An Extra Storeroom

The people at Equity Lumber Co, Painsville, Ohio, are really sold on electric heat. When they were planning their new building, they asked for some figures on electric vs gas heat. The estimates came in, they chose electric, and got an additional storage room practically for free!

By installing electric heat the company was able to eliminate a 600-sq ft partial basement. This was to house a gas furnace, necessarily located as close to the center of the building as possible. The money saved by cutting out the basement went toward a 1,000-sq ft storeroom to be used for receving, shipping and storage.

A total of 57.6 kw of electric heaters went into the building. Breakdown: 71 baseboard heaters, adding up to 42.6 kw, and eight wall units, accounting for 15 kw. In addition, two 40-gal electric water heaters were installed along with 15 kw worth of lighting load. Thermostats were set at daytime comfort levels and left that way. There was no night or weekend set-back.

The 40 x 90 x 10-ft frame-masonry structure has a calculated heat loss of 148,381 Btu per hr. Total heating cost for the 281-day 1955-56 heating season ran $337.25 or $1.20 a day. Equity bought their kwhrs for 1.6¢ from Painsville's Municipal Light Plant. The utility, incidentally, cooperated extensively on the engineering and installation. Painsville had 6,192 deg-days during this heating season, so cost averaged 5.4¢ per deg-day. *Estimated cost of operation with gas for the heating season was about $600.*

Although the heating season started Oct. 1, the ceiling was not insulated until Dec. 1. The effect showed up immediately. Kwhr per deg-day dropped from 4.6 for November to 3.0 in December.

Employee's reactions to the electric heating are good, and the company is happy. Conclusions:

- Electric heat affords big first-cost savings—no furnace room, flues, etc.
- Electric heating operating costs are competitive.

In any electric heat job, pay careful attention to the building insulation. If it's poor, customer will blame it on the installation.

Cleanliness, convenience and uncluttered spaces boost employee efficiency and morale.

(More Selling on page 128)

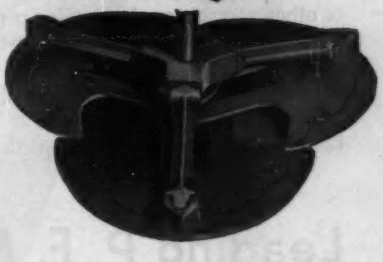
The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power

QUICKLY Installed

TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO

FAIRFIELD, IOWA

Reduce Maintenance in Dusty Atmosphere

L. R. ROWTON, Lighting Engineer, East Bay Division, Pacific Gas & Electric Co, Oakland, Calif.

New fluorescent lighting has reduced maintenance and eliminated frequent replacing of bulbs at the Stauffer Chemical Co plant, Richmond, Calif. The new lighting also has eliminated the use of portable lighting formerly required for casual inspection of machinery.

The luminaires provide continuous lighting in inspection areas around three large sulphide roasters which create large quantities of dust. Inspection areas formerly were illuminated by 40- and 60-w incandescent bulbs which, due to their heat, soon baked on a coat of dust that cut off all light. With the bulbs themselves barely visible, it was necessary to use flashlights or other portable equipment for periodic inspections.

New lighting consists of vapor-tight, 4-ft single-tube fluorescent lamps with plexiglass shields. Lamps located on about 12-ft centers on all sides of the roasters provide a lighting level of about 3 ft-c. This is satisfactory for casual inspection of the units.

INSPECTION LIGHTING stays near 3 ft-c with fluorescents. Previously, heat of incandescents baked dust to semi-opaque

The cooler-operating fluorescent lamps do not bake the dust onto the plexiglass shields. Periodic dusting is the only maintenance required. As was past practice, supplementary portable lighting is used during heavy maintenance and overhaul of the roasters.

Leading P. F. Motor Cuts Power Costs

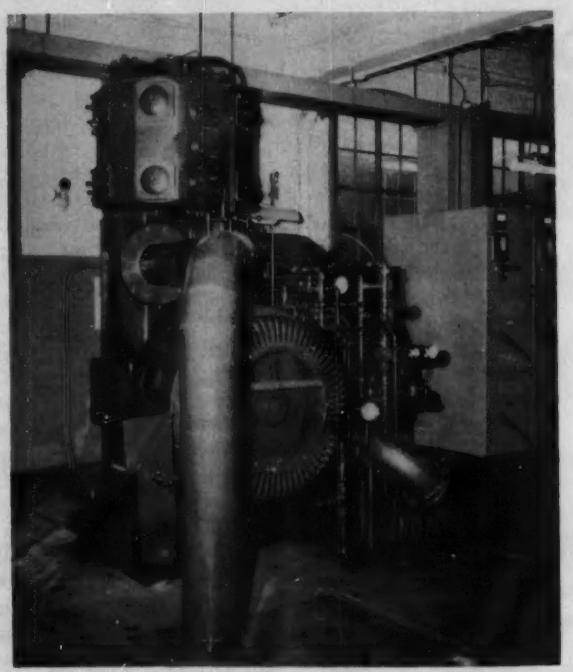
J. H. TARBELL, Industrial Engineer, Kansas City Power & Light Company, Kansas City, Missouri

Installation of a 200-hp motor with an 80% leading power factor at the Vendo Co, Kansas City, Mo. vending machine manufacturer, improved the company's overall power factor enough to more than justify the extra cost of the special motor. Purchased to increase the supply of compressed air for Vendo's expanded production, the machine cost $1,500 more than a comparable unity power factor machine.

Vendo purchases electric power under a rate containing a power factor clause that provides a debit of 20 cents per month for each kilovar by which the reactive demand exceeds 50% of the maximum kilowatt demand. A corresponding credit is allowed when reactive demand falls below 50% of maximum kilowatt demand.

When Kansas City Power & Light was consulted, it was found that Vendo's in-phase demand was 1,404 kw with a reactive demand of 867 kilovars. Because of the power factor clause, this meant Vendo was paying an extra $33.00 per month for low power factor. By using the special motor reactive demand fell to 754 kilovars, in-phase demand went up to 1554 kw.

Overall effect was that instead of a debit of $33.00 per month, the company had a credit of 23 kilovars or $4.60, making a total monthly saving of $37.60. This will repay the extra initial cost about three years.



200-HP MOTOR WITH 80% leading power factor improved overall load power factor enough to cancel low power factor debit charge, earn credit instead

NEW

No. 53-XPJ Nicopress Tool with *Three Grooves*

Accommodates Nicopress Sleeves

FOR COPPER
1 solid, 1 seven strand, 2 solid, 2 seven strand, 2 three strand, 3 solid, 4 solid, 4 seven strand, 4 three strand, 6 solid, 6 seven strand, 8 solid, 8 seven strand, 3 No. 10, 3 No. 8.

FOR COPPERWELD
4A, 6A, 8A, 6C, 8C, 6D, 8D, 9½D, 3 No. 10, 3 No. 12, 4 solid, 6 solid, 8 solid, 10 solid.

FOR ALL-ALUMINUM
2 solid, 2 seven strand, 4 solid, 4 seven strand, 6 solid, 6 seven strand, 8 solid.

FOR AMERDUCTOR
8SCP or SCG, 10SCP or SCG, 12SCP or SCG.

Write for descriptive folder.

Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and foreign countries.

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

An example of Allis-Chalmers leadership

They Whisper While They Work!

These two 100,000-kva Allis-Chalmers transformers are good neighbors... thanks to careful pre-planning.

Installed in the middle of a residential area, these two large transformers could have created a public relations headache.

They didn't . . . because of elaborate planning by the utility's engineers working together with A-C.

In fact, this installation is a model of what can be done.

Before any designing was started, Allis-Chalmers mobile sound laboratory equipment was brought in. Day and nighttime studies of ambient characteristics indicated that the most economical solution to the problem required a twofold attack.

1. Design and build a low noise level transformer unit with frequencies melded to the ambient.

2. Build a masonry barrier around the transformers to reduce the noise level further.

So critical were the conditions that neither step by itself would do the job.

Today, the transformers are in full operation . . . and there are no complaints from the neighbors.

Transformers like this are an outgrowth of continued research by Allis-Chalmers into magnetostriction and resonance in A-C sound laboratories, acoustical proving ground and mobile research unit.

* * *

For help in finding the best and most economical means for solving sound problems, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

This was the area with residences as close as 170 feet from the proposed transformer locations.

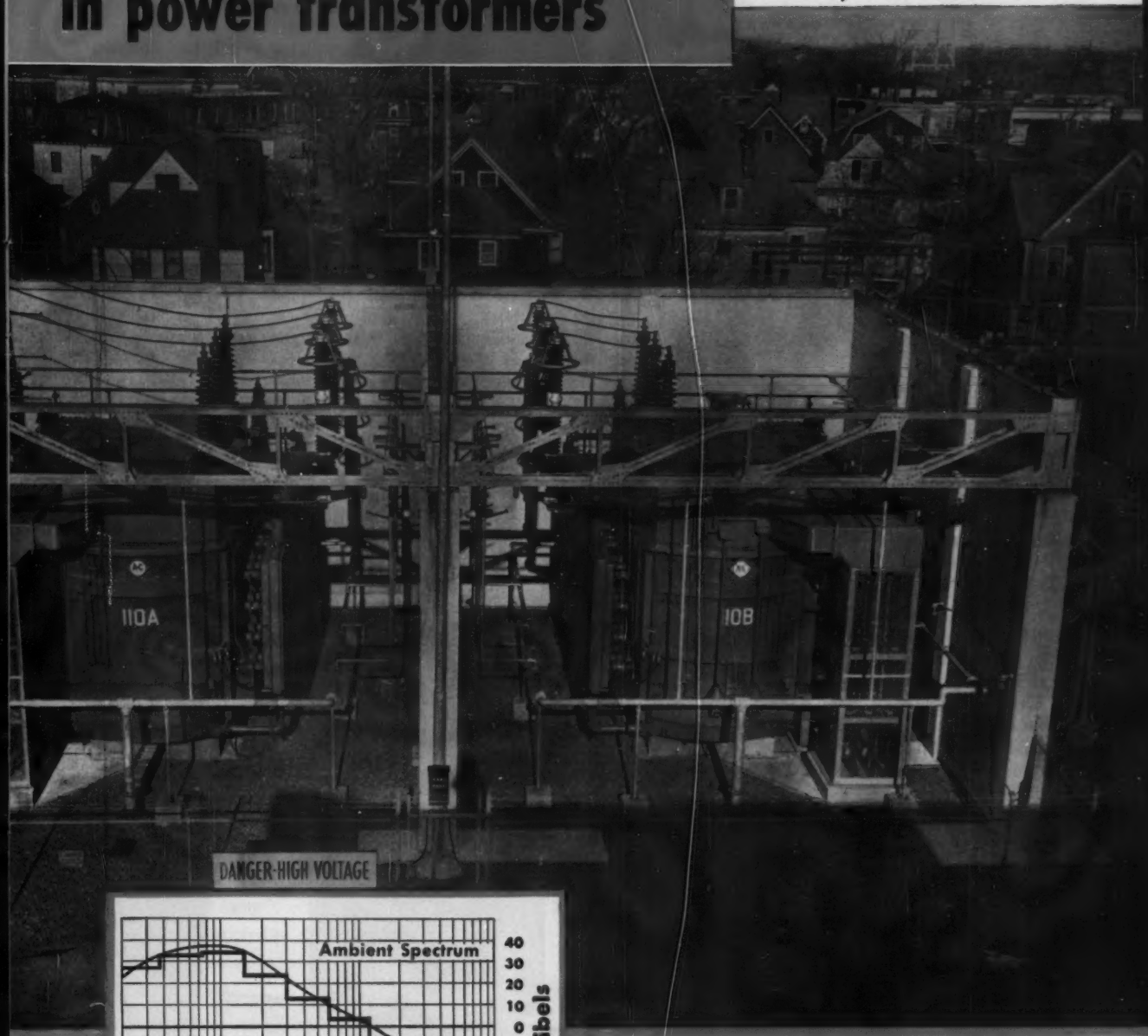
Mobile sound testing equipment was brought in to study ambient characteristics and find a noise level that would not be objectionable.

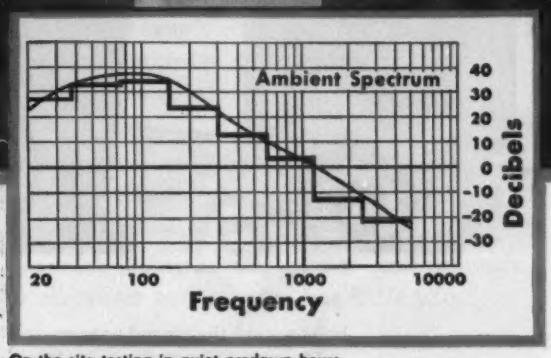
A-C ALLIS-CHALMERS

ALLIS-

A-5353

in power transformers

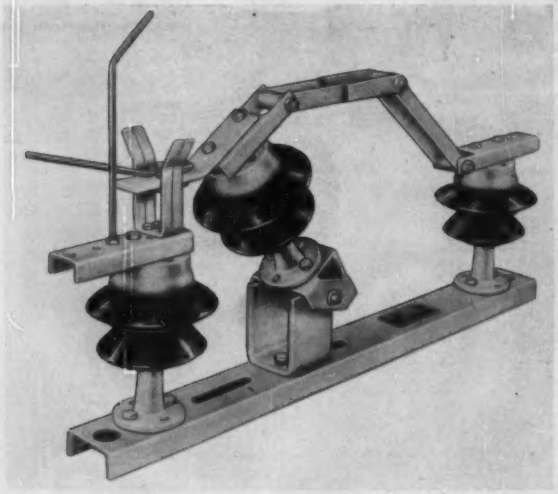




On-the-site testing in quiet predawn hours determined minimum masking noises.

Transformer noise level lower than standard and use of masonry barriers were dictated by the severe requirements of the neighborhood.

CHALMERS



Tilting Insulator Switch

This shuntless, tilting insulator switch has pressure loaded, annular silver-to-copper bearing surfaces at all hinge points, eliminating the flexible braid connector. The only make-and-break contact is high pressure, silverplated, hard-drawn copper to beryllium copper at the jaw.

Switch is available with ratings of 7.5 and 34.5 kv, at 200, 400, and 600 amp, with standard momentary ratings. It can be used on interphase shafts or standard cross-arm timber. Load-break units can be furnished with switch or as field conversion unit for "arcless" switching of full load, line charging, and magnetizing current.

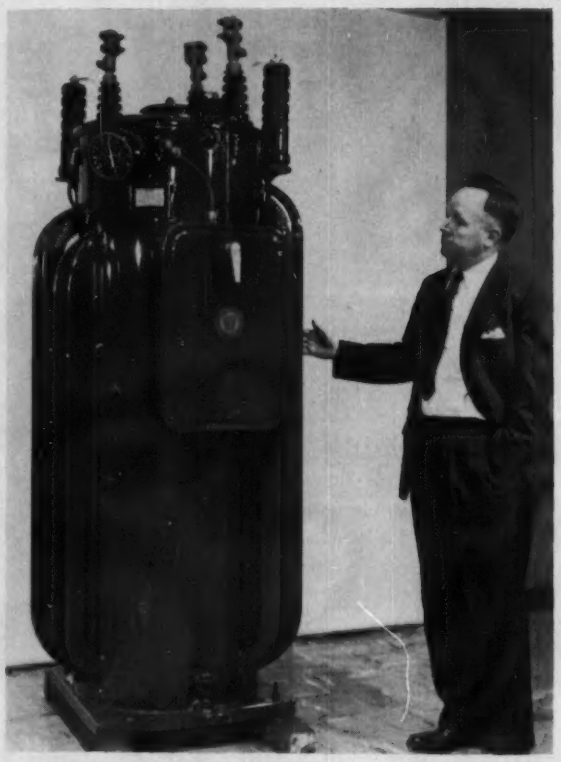
R&IE Div, I-T-E Circuit Breaker Co, Greensburg, Pa.

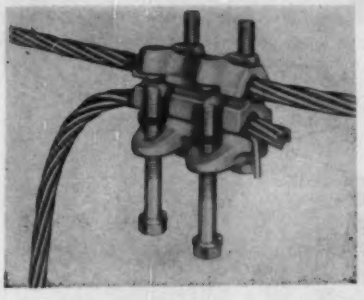
Step Regulator

Single-phase, 16-step regulators, designated Type URF, are available in ratings through 100 kva at 2,500 and 5,000 v, 167 kva at 7,620 v, and 138 kva at 13,800 v. Direct Geneva gear drive is said to permit traverse from full buck to full boost in less than 13 sec. Inverse time delay and 1.25% steps speed voltage correction, narrow effective voltage bandwidth.

A separate tap changer compartment reportedly keeps contaminants formed during changing out of core and coil. Tank cover is secured by a single bolt through its center. Tap changer contacts can be inspected through cover manhole. Hand crank for emergency operation needs only 2⅔ revolutions for tap change.

Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.





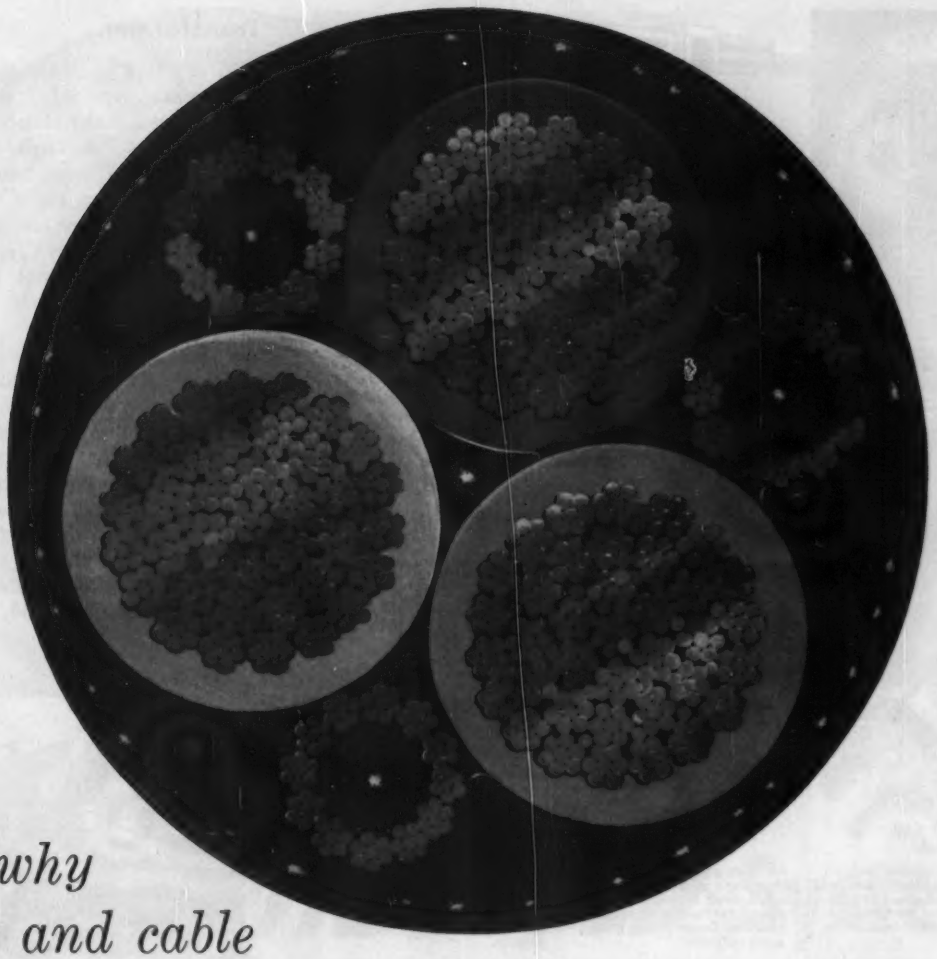
U-Bolt Connector

This heavy duty, 4-bolt one-piece aluminum connector handles conductors from 2/0 to 397.5 Mcm ACSR, 3/0 to 400 Mcm AWG. It is installed by loosening two free bolts contained in bottom housing with neoprene washers, hanging connector over main, inserting tap wire, and tightening. Two captive bolts secure the ringed spacer.

Housings are non-copper-bearing alloy; spacer is soft aluminum pig. It has heavy coating of oxide-inhibitor. Connector reportedly has all advantages of multiple U-bolt unit but is easy to install.

Jasper Blackburn Corp, 35 Madison St, St. Louis 6, Mo.

(More New Equipment on page 134)



why wire and cable jacketed with neoprene give extra-long service

Neoprene resists weathering—resists deterioration from exposure to sunlight, weather, temperature extremes for years of service.

Neoprene resists ozone and corona cutting—neoprene is the standard jacket on high-voltage cable.

Neoprene resists oil and grease—and exposure to chemicals and solvents has little effect.

Neoprene has over a quarter-century of field experience behind it... so you can count on proven dependability. Resilient neoprene has excellent resistance to flex cracking, abrasion, chipping and cutting. It won't support combustion and it protects against electrolytic attack. This remarkable balance of properties is the big reason why neoprene is the best jacketing material for wire and cable. For full details get in touch with your wire and cable supplier.

DU PONT
REG. U. S. PAT. OFF.

Better things for better living
... *through chemistry*

neoprene
—made by Du Pont for 25 years

E. I. du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept. EW-5
Wilmington 98, Delaware

FREE! THE ELASTOMERS NOTEBOOK! Every issue contains interesting case histories about products made with neoprene. Clip this coupon to get on the mailing list.

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MAIL THIS COUPON NOW—WHILE YOU'RE THINKING ABOUT IT→

for greater plant safety and security

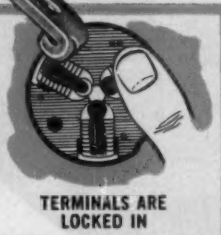
REPLACE NOW

WITH SUPER Twist-Lock®

featuring Screwless Pressure-Grip Terminals and *Dead Front*

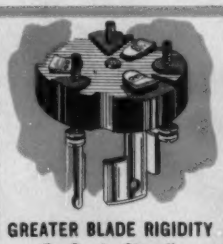
2 PC. DEAD FRONT CAP For Greater Safety

Dead front completely encloses cap, keeps out foreign particles that might short-circuit contacts. No need for fibre insulating disc, therefore no extra parts to lose or forget to use.



TERMINALS ARE LOCKED IN

Terminals are pressure-gripped in place, can't pull out. Conductors are confined in their individual pockets, can't spread. No danger of flash over. Design assures greater wiring uniformity.

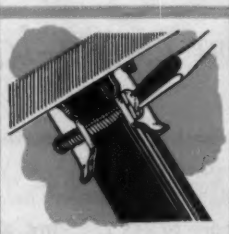


GREATER BLADE RIGIDITY For Greater Strength

Stronger, rigidly supported contacts withstand hard knocks, retain uniform alignment and maintain polarity.

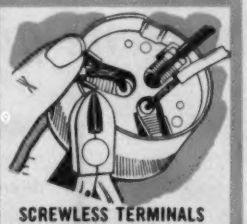
HEAVIER ARMOUR BUT MORE COMPACT For Longer Life, Safer Performance

Rugged protective steel shell protects inner construction, resists the roughest industrial usage.



IMPROVED CORD GRIPS RELIEVE STRAIN FROM CONTACTS

Powerful cord grip design provides pull-proof pressure grip on cable.



SCREWLESS TERMINALS SPEED WIRING... CUT COSTS

No awkward binding posts. 2-pc cap and connector body can be wired in ⅓rd the time, thus reducing installation costs.

Interchangeable with Regular Twist-Lock units of equal rating.

Folder tells the complete story. Write today.

HARVEY HUBBELL, INC.

HIGHEST QUALITY WIRING DEVICES • MACHINE SCREWS

DEPT. E-2 BRIDGEPORT 2, CONNECTICUT

WIRING DEVICE WAREHOUSE LOCATIONS ASSURE NATIONWIDE STOCK AVAILABILITY

Bridgeport 2, Connecticut
State and Bostwick Streets

Chicago 7, Illinois
37 South Sangamon Street

Los Angeles 12, California
103 North Santa Fe Avenue

San Francisco, California
1675 Hudson Avenue

Dallas 7, Texas
1111 Dragon Street

Transformer

A dry type, 3-phase distribution transformer, type DT-3, is available in 600 and 2,400-v classes with ratings from 45 through 300 kva. Using an inorganic insulation, it is designed for a 150 C temperature rise. Units are reported to be smaller than previous Class B, 80-C design, with reductions of 17 to 32% in weight, 25 to 51% in volume.

Mechanically isolated core and coils are said to reduce sound level, allow direct connection to rigid conduit without noise transmission. To permit use of low temperature conductors, all terminal boards and connections are in compartment at bottom of unit where temperature is at ambient level.

Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Ditcher

This wheel-type ditcher, Model 774, can dig a 5.5-ft ditch of any width between 18 and 30 inches. Digging width is adjustable in one-in. increments. Forward crowding speeds are independent of the digging wheel speeds and are controlled by a hydraulic drive which can be set to any speed between zero and 28 ft per min.

Connection between wheel and chassis is a dual, flexible design which permits a 10-deg pivot while digging. Power to the digging wheel is supplied through a telescoping drive shaft, with universal at each end. Wheel is raised and lowered with a hydraulic hoist. An 8-ft spoil conveyor driven by two reversible hydraulic motors provides speeds between 200 and 650 ft per min.

Barber-Greene Co, Aurora, Ill.

(*More New Equipment on page* 138)

INCREASED SAFETY with enclosed bus bars, unique trolley arm Safety-Slot.
FAST, COST-REDUCING INSTALLATION with longer, lighter track sections.

DEPENDABILITY ASSURED—strong aluminized steel housing, rugged petticoat insulator, husky trolley components.

New *LEC-TROL-FEED* System

for fast-action installation—safety-first power

This new, preassembled LEC-TROL-FEED conductor system gives you outstanding advantages for supplying electric power to cranes, hoists, welding units and other straight-runway equipment.

LEC-TROL-FEED Systems are installed faster and at lower cost than ever before. All units are preassembled in standard 30 ft. rigid-track sections. That means fewer joints, fewer hangers. Expansion sections are needed only at building joints. No extra rain shields needed for outdoor applications.

You gain maximum safety with LEC-TROL-FEED Systems because current carrying bus bars are almost completely enclosed—minimizing danger from contact with current-carrying bus. Trolley Safety-Slot covers are removable—parts easily accessible. Rugged trolley—can be dropped out every 30 feet.

Additional features include compactness for close vertical stacking, maximum ruggedness, maximum leakage distances, proved aluminum bus bars. Track power capacity 300 amperes, AC or DC; trolley ratings up to 300 amperes.

For complete information,
write or ask for LEC-TROL-FEED Bulletin.
Electric Service Works,
Delta-Star Electric Division,
H. K. Porter Company, Inc.,
Philadelphia 32, Pa.

HKP ELECTRIC SERVICE WORKS
DELTA-STAR ELECTRIC DIVISION
H. K. PORTER COMPANY, INC.

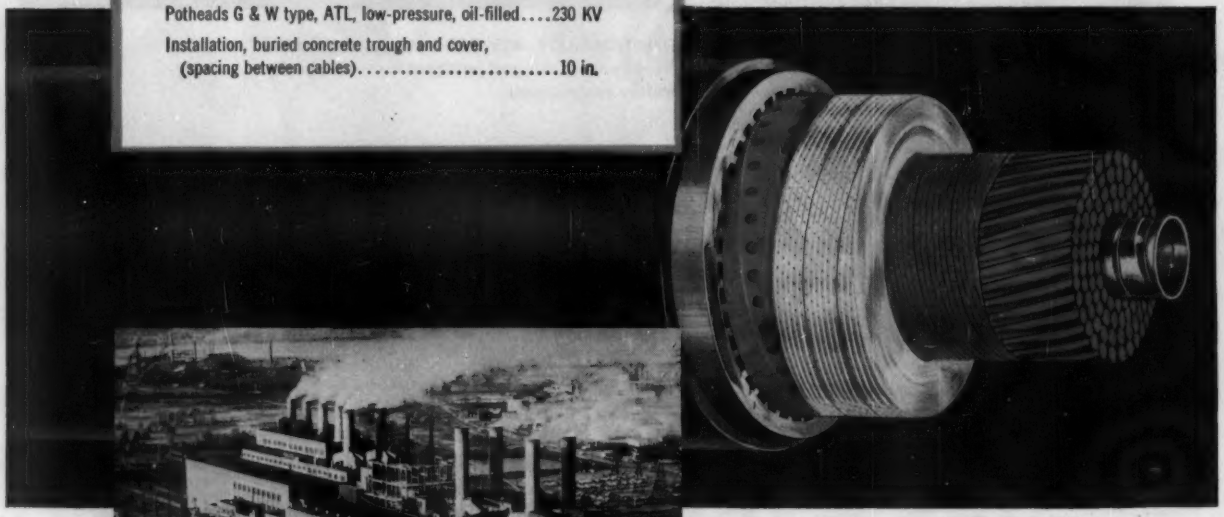
Divisions of H. K. Porter Company, Inc. are: Connors Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Loschen Wire Rope, McLain Fire Brick, Quaker Rubber, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings

Phelps Dodge

FIRST 230-KV FOR

Circuit Data and Cable Rating

Type	Low-Pressure, Oil-Filled to AEIC 5th Edition
Cable Rating (nominal)	230 KV
Number of Circuits	2
Number of Cables	7
Capacity, each circuit (at 95% daily load cycle)	240,000 KVA
Length, each circuit (approx.)	1,500 feet
Cable construction	
Steel spiral hollow core I.D.	500 mils
Conductor concentric copper	1,250 M.C.M.
Impregnated wood pulp paper (nominal thickness)	835 mils
Habirloy arsenical fluted lead sheath (lead over flutes)	160 mils
Habirlene (polyethylene) jacket	115 mils
Maximum operating oil pressure	16 psi
Type CC oil reservoir each end, each cable	21 gals.
Maximum conductor copper temperature	
Normal	70° C
Emergency	75° C
Potheads G & W type, ATL, low-pressure, oil-filled	230 KV
Installation, buried concrete trough and cover, (spacing between cables)	10 in.



Cable will connect the main step-up power transformers to the 230-KV switchyard at Niagara Mohawk's Huntley Station shown here.

to make

LOW-PRESSURE, OIL-FILLED CABLE COMMERCIAL USE IN THE U.S.A.!

Output Circuit for Largest Unit of Niagara Mohawk Power Corporation Will Have Some New Features

Phelps Dodge Copper Products Corporation has been chosen by Niagara Mohawk Power Corporation to provide the first 230-KV low-pressure, oil-filled cable for commercial use in this country. The first 230-KV compression cable for use in the U. S., installed at Garrison Dam in North Dakota, is also a Phelps Dodge product.

The cables will be used to integrate new generating units into the Niagara Mohawk System by linking up the main step-up power transformers to the 230-KV switchyard at the Charles R. Huntley Station in Buffalo.

Cable specifications call for some of the longest low-pressure, oil-filled cable lengths ever made. Three single conductor cables are planned for each of two circuits, together with one spare cable. All cable lengths will be continuous without splices.

The cable design will include two unusual features: direct burial—a new installation method for this type of cable in the U. S.; and, for the first time anywhere on this class of cable, a protective jacket of corrosion-proof polyethylene will be used over the cable's lead sheath. Actual production of the cable will be preceded by the manufacture of a prototype cable and extensive testing. Present plans call for the cable to be installed during the early months of 1957.

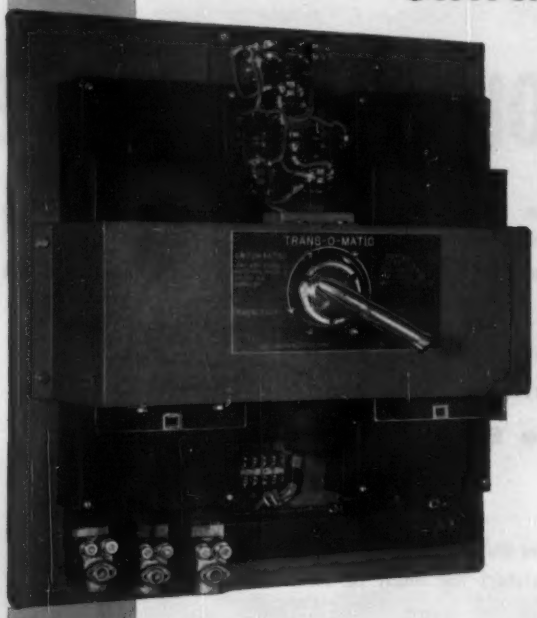
PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.

DOUBLE-THROW DUAL CIRCUIT BREAKER DESIGN

TRANS-O-MATIC

AUTOMATIC TRANSFER SWITCH



gives you

CAPACITY

SENSITIVITY

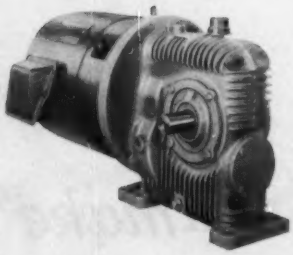
COMPACTNESS

- Full range to 50,000 amp. interruption capacities, 600 V. 800 A. loads.
- Complete failure two-wire or three-wire protection, or full relay 3 phase, 3 wire protection with transfer when any or all legs drop below 90%.
- About one half the size of similar equipment, suitable for switchboard, deadfront panel mounting, or separately in NEMA-Type closures.

Trans-O-Matic employs two standard circuit breakers; one from the normal and one from the emergency source. Either will carry the load. Mechanical linkage with supervisory relays are of double source control design.

OPTIONAL . . . adjustable time delay . . . engine starting contact . . . test pushbutton . . . pilot lights for switch position . . . special enclosures.

LAKE SHORE *Electric* **CORPORATION**
200 WILLIS AVENUE
BEDFORD, OHIO



Gearmotor

Right-angle gearmotors for reduced speed industrial applications are available in sizes from one to ten hp for continuous duty and from one to 30 hp for intermittent duty. The footless motor bolts directly to the gear housing and may be a-c or d-c, with any speed or duty rating. Protected-open, totally enclosed, and explosion-proof types enclosures are available.

Other reported features include horizontal or vertical mountings, conventional double-ended shaft and hollow shaft, and a double-enveloping worm gear set for secondary reduction.

Reliance Electric & Engineering Co. 24701 Euclid Ave, Cleveland 17, Ohio.

Welders

Motor-generator welders which may be stacked one on top of the other to save space are available for light, medium and heavy metal arc and inert arc welding. Type WD30-AE is rated at 300 amp., type WD40AE at 400 amp. Open circuit voltage is 80 v. A fast response magnetic starter with bi-metallic thermal overload relays prevents motor burnout in the event of overload. Relays reportedly kick out in less than 10 sec in stalled single phase operation and in less than 8 sec when rotor is locked in normal 3-phase position.

The welders are said to produce high recovery voltages and controlled current peaks with pop-out-free arcs. Other features reported are prelubrication, sealed bearings, and weather resistant, self-ventilated case.

General Electric Co, Schenectady 5, N. Y.

(More New Equipment on page 142)

This machinist is "miking" a disc for one of the largest butterfly valves ever built — 192" diameter. Newport News built 3 such valves, each weighing 446,000 lbs., for the Ross Power Plant, Skagit Project, Department of Light, City of Seattle, Washington. Designed for a water flow of 3,620 cu. ft. per sec., and a hydrostatic pressure of 290 psi., these valves were shop tested by Newport News at 450 psi. They are hydraulically operated with oil at 1,500 psi. pressure.

Birth of a **200-ton** Butterfly

This disc for a 16-foot butterfly valve reflects two basic advantages of Newport News fabrication...

First, it exemplifies the *careful attention* Newport News craftsmen give to every detail. And secondly, it attests to the *quality* with which Newport News produces in massive equipment for public utilities and allied industries... due to Newport News' high integration of skill and production facilities.

Additional advantages accrue to customers from extensive work conducted in Newport News' testing laboratories on problems related to water power equipment.

Avail yourself of the engineering talent, along with the specialized production techniques and the skill of Newport News craftsmen operating vast steel fabricating shops, five huge machine shops, drop forging and die facilities along with acres of brass, iron and steel foundries.

Let us bid on equipment for your present or future projects. If you are not familiar with the way Newport News can help you, write for our illustrated booklet entitled "Water Power Equipment" ...it's yours for the asking.

NEWPORT NEWS

Shipbuilding and Dry Dock Company
Newport News, Virginia

"The new Space-Miser is a big forward step in transformer design," says Mr. Howard A. Brown, Superintendent of Electrical Distribution for the Rochester Gas & Electric Corporation. "The new, smooth surfaces eliminate moisture-trapping areas. This reduces corrosion and lowers maintenance costs. When we have to refinish a transformer, the Space-Miser design helps us to do a better job, faster, because all surfaces are easily reached."

"New, streamlined Space-Miser cuts maintenance...

transformer corrosion in network installations reduced, even during city's ice-control program,"

says Rochester Gas & Electric Corporation

Each year, the fight of many cities against winter ice and snow creates big problems for the network. Salt and chemicals, the city's weapons against the hazards of winter, mix with snow and ice to form corrosive slush.

Network transformers—though hidden from sight in subway installations—are highly vulnerable. In addition to normal weather moisture, slush from streets and sidewalks runs into these vaults. Westinghouse Space-Miser network transformers are especially designed to shed corrosive debris and provide many other new advantages.

LESS MAINTENANCE TIME, COST—New, smooth contour tank design with Yukon Coolers eliminates sharp edges and debris- or water-collecting areas. Streamlined design makes cleaning easier, repainting simpler.

PROTECTION AGAINST PARTIAL VAULT FILL-UP—Space-Miser design reduces height 12 inches, allows off-the-floor, I-beam installation to keep transformer out of debris.

LOWER INSTALLATION COSTS—New design reduces weight and volume by 20%, permits faster, easier installation, safer handling.

EASY ACCESS TO HIGH-VOLTAGE TERMINAL CHAMBER—Lowered switch and terminal compartment makes sharp cable bends unnecessary. Extra four-inch width in chamber simplifies forming and connecting high-voltage cable.

For the complete Space-Miser story call your Westinghouse sales engineer . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70813

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Mr. Leon G. Atkinson, Assistant Superintendent, Line Maintenance Department, Rochester Gas & Electric Corporation, supervises installation of new Westinghouse Space-Miser network transformer.

COMPLETE SELECTION OF

TEST TABLES

offered by . . . THE STATES COMPANY

Leaders in Electrical Testing Equipment

States Test Tables require no special rotating standards and may be equipped to test 2 and 3 element meters, socket and bottom terminals, as well as single phase.

FORM "FRS"—Single position table with photo-electric control. Will test single phase and 2 and 3 element polyphase meters.

FORM "HAPBL"

Dimensions: 20" x 20" x 15". Other styles of this table may be furnished equipped with photo-electric control.

"FRD"—Two position photo-electric only or photo-electric and "push button" automatic sequence.

THE STATES COMPANY
19 New Park Avenue, Hartford, Conn.
Send me your new catalog on TEST TABLES.

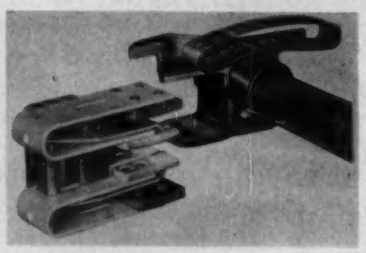
Name .....Title.....
Firm Name.....
City .....Zone....State.....

Armored Cable

Flexible, interlocking armored cable, known as Circloc, is offered with three or four conductors for indoor or outdoor use. Individual conductor insulation may be rubber or varnished cambric. Armor may be aluminum, bronze, or galvanized steel. A neoprene sheath is added between conductors and armor for outdoor use.

For 600-v service, maximum conductor size is 500 Mcm for 4-conductor varnished cambric cable, 750 Mcm for 3-conductor varnished cambric and 3- and 4-conductor rubber insulated cable. Rubber insulated cables are available to 750 Mcm for 5,000-v service and 15,000-v grounded neutral service; to 500 Mcm for 15,000-v ungrounded neutral operation. For indoor or outdoor use, three-conductor, neoprene-jacketed cable with varnished cambric insulation can be obtained in sizes to 750 Mcm for 5,000-v duty, to 500 Mcm for 15,000-v grounded neutral duty, and to 350 Mcm for 15,000-v, ungrounded neutral use.

Circle Wire & Cable Corp, 5500 Maspeth Ave, Maspeth, L. I., N. Y.

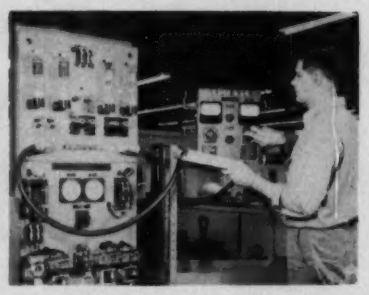


Contact

Used on the Alduti double break load interrupter, these contacts reportedly make 4 superior, silver-to-silver, point contacts, preloaded to a precise spacing with a tension bar and spacer. Contact pressure spring on either side of the knife has three point suspension that allows contact movement to cope with vertical or angular misalignment.

Contact conductors are in the form of U's. Manufacturer claims that magnetic forces created by heavy short circuit currents push the two branches of each U apart but drive the two inner branches together, increasing the grip on the blade. Contacts are said to be maintenance free and long-lived, with a minimum of pitting or welding.

S & C Electric Co, 4435 Ravenswood Ave, Chicago 40, Ill.



Mill Regulator

A dual-circuit, variable speed electronic mill regulator, the VSMR is designed for continuous process mills in the paper, rubber, glass, and non-ferrous metal industries where continuity of performance is important. It is available with either a 6- or 10-amp output.

In normal operation, two sets of thyratrons, operating in parallel, split the load. In case of tube failure, the operable set of thyratrons is said to carry the full load. Building block techniques, used "canned" circuits imbedded in plastic, are reported to reduce effects of dust, dirt, or corrosive atmospheres and simplify maintenance. A portable test fixture, designed for the VSMR, permits checking and maintenance by plant electrician without disconnecting any wires.

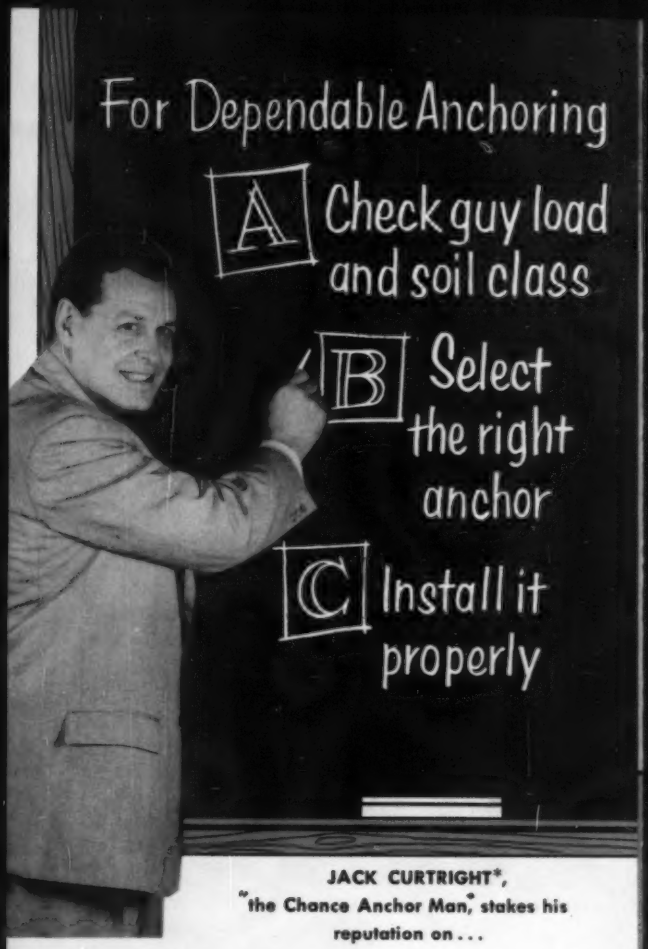
Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio

Reel Lift

The model RL31 Reelift can be used to lift reels up to 48 in. in diameter and 31 in. wide. It is of all-welded construction and measures 48 in. high, with a 23 by 39-in. base. Weight is 85 lb. Manufacturer claims one or two men can handle heavy reels easily with it.

Hykon Mfg Co, P. O. Box 923, Alliance, Ohio.

(*More New Equipment on page* 147)



JACK CURTRIGHT*, "the Chance Anchor Man," stakes his reputation on . . .

the A B C's of Anchoring

Good anchoring is low cost insurance against line sag, leaning poles, storm damage, and other line construction failures.

The formula for good anchoring is as simple as A-B-C and just as basic . . . Check the guy load, determine the type of soil and what it will hold, select the *right* anchor for the soil and guying condition, and install it properly. Chance engineers have made this an easy formula to follow by designing an anchor for every guying condition.

In tests by anchor users, Chance Anchors almost always take top position for holding power and for ease of installation in their specific applications.

A lways B e C onfident

A lways B uy C HANCE

*Chance Anchor Sales Manager

Serving the Utility Industries since 1907

50TH ANNIVERSARY

A. B. CHANCE COMPANY

Give the GUY a CHANCE... there's a CHANCE ANCH

8 WAY EXPANDING ANCHORS

FOR "ALL 'ROUND" HOLDING POWER

It's not surprising that in every field test the Chance 8-Way Expanding Anchor holds more than its rated load because its design just makes common sense. Eight blades expand to form a pyramid shaped square—there is no wasted space between blades. The load is distributed evenly—all around the hole. It seems logical that it should hold more, and it does. That's why it's on so many company standards.

The 8-Way is usually installed in clay or loam. Available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying.

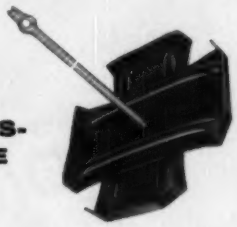
FIELD ASSISTANCE

Chance Regional Guying Specialists have the practical experience and technical know-how to demonstrate proper anchoring to your field personnel and make field tests to aid in anchor selection.

NEVER-CREEP

Reinforced structural steel. Pulls entirely against solid, undisturbed earth. For extra heavy loads in clay or loam.

CROSS-PLATE



For heavy-duty anchoring in machine-bored holes. Holds better than logs or slugs. Saves time and money.

SWAMP SCREW

For swamps, r
crossings or se
Screws down
tions of pipe.

EXPANDING ROCK

No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.

WRENCH SCREW

All steel—dou
hub absorbs in
loads in sandy

Your Chance Anchor Distributor can su

EXTRA! EXTRA!
Here's good news for your guy
Read all about it in "Anchoring."
Yours for a post card!

MIKE THE MOLE says:

Here is the most complete guide to better anchoring ever developed. It's chock full of how-to-do-it material to help you select the right anchor for every guying job—and install it properly. It's FREE!

CHOR for every guying need

NO-WRENCH SCREW

For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

MP
EW

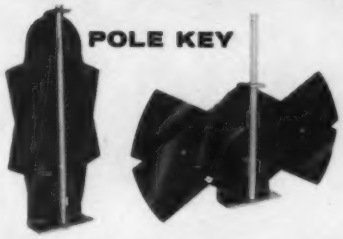
mps, marshes, quicksand, river or seasonally flooded areas. down deeply by adding sec- pipe.

8-WAY CONE

Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

NCH TYPE
EW

—double arc welded. Anchor orbs installation strain. For light sandy soil, soft clay or loam.



POLE KEY

Keys poles at the butt to reinforce them against unbalanced loads in soft soil. Ideal for congested urban areas.

an supply you from stock. Specify Chance for Service!

CA57-1

guys! ring."

A. B. CHANCE CO.

Centralia, Missouri

O.K. Have "Mike" send us ____ copies of "ANCHORING"

NAME _____

TITLE _____

COMPANY _____

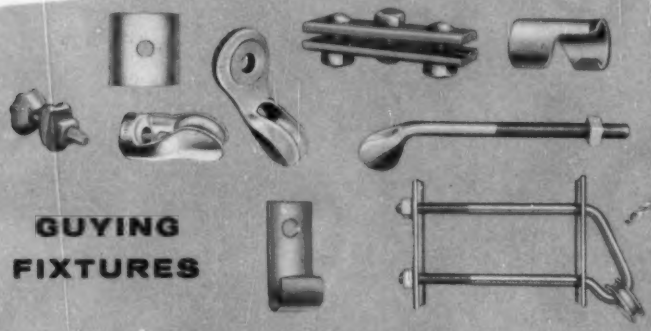
ADDRESS _____

CITY _____

STATE _____

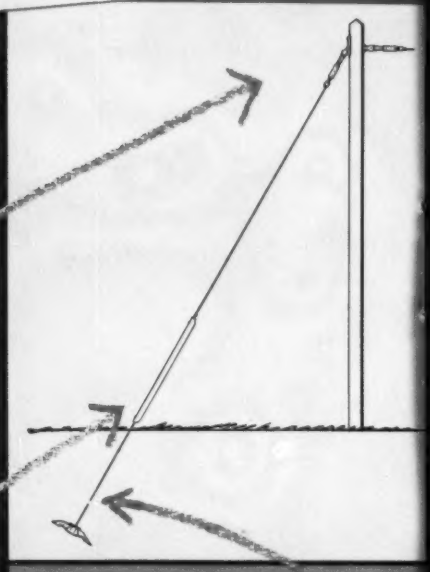
CHANCE Guying Equipment

for the BEST in guying



GUYING FIXTURES

For neatness, efficiency and economy nothing equals Chance Guy Fixtures on the pole. They save the wrap-around strand, and the full-rounded Thimbleye gives complete strand protection during slack pulling operations and when in use. Chance fixtures are drop forged from high grade steel—heavily galvanized. The line includes everything for the guy.



CHANCE GUY GUARDS

EASY INSTALLATION

HIGH VISIBILITY

LONG LIFE

MONO-BOLT GUY GUARD

TAPERED GUY GUARD

Chance Mono-bolt Guy Guards are easy to install. No stretching for high bolts—the single, easily accessible bolt is at the bottom of the guard. Mono-bolt Guards come in half or full round construction, in 7 or 8 foot lengths.

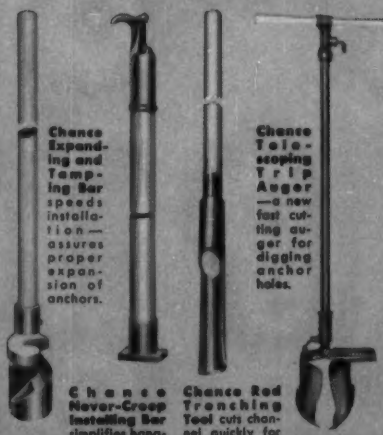
Chance Tapered Guy Guards fit over all kinds of guy clamps—even large U-bolt types. Full round construction, 8 foot lengths.

These guards fit any size rod from ½" to 1¼" and are made of hot galvanized steel for long life and high visibility.

GUY RODS

There is a difference in anchor rods—in the shape of the eye and in the galvanized protection. The full rounded Thimbleye design, an A. B. Chance Company development, protects the cable from strain at any angle of pull, prevents binding and aids slack pulling. You get the same protective contour in Thimbleye, Twineye, or Tripleye Chance rods, Threaded or Never-Creep types.

CHANCE TOOLS *for faster installation*



Chance Expanding and Tamping Bar speeds installation—assures proper expansion of anchors.

Chance Telescoping Trip Auger—a new fast cutting auger for digging anchor holes.

Chance Never-Creep Installing Bar simplifies hanging of plate anchors on rod.

Chance Rod Trenching Tool cuts channel quickly for cross plate anchor rod.

ABC INDUSTRIES

A·B·CHANCE CO·

Splicing Kit

This cable splicing kit includes a crimping press, cable cutter, and vulcanizing mold and can be used to make vulcanized, neoprene insulated splices in the plant or in the field. Finished insulation of the splice is said to withstand 2,500 v without leakage.

Bare ends of the cables are inserted in a copper tube and crimped. An inner sleeve placed over the crimp keeps the splice flexible and eliminates voids. The outer sleeve is then vulcanized to the cable jackets. The cable splice is tapered and is reported to be only slightly larger than the cable itself.

Manufacturer claims conductivity of splice equals that of cable. Equipment operates from a 110-v line.

Cam-Lok Div, Empire Products, Inc, P. O. Box 98, Cincinnati 36, Ohio.

Reel Cart

This reel cart can handle reels with diameters up to 48 in. and widths to 32 in. Capable of lifting reels weighing as much as 1,500 lb, it can be used as a metering stand in paying out cable, as a turntable for large coils, or to transport reels of cable and wire.

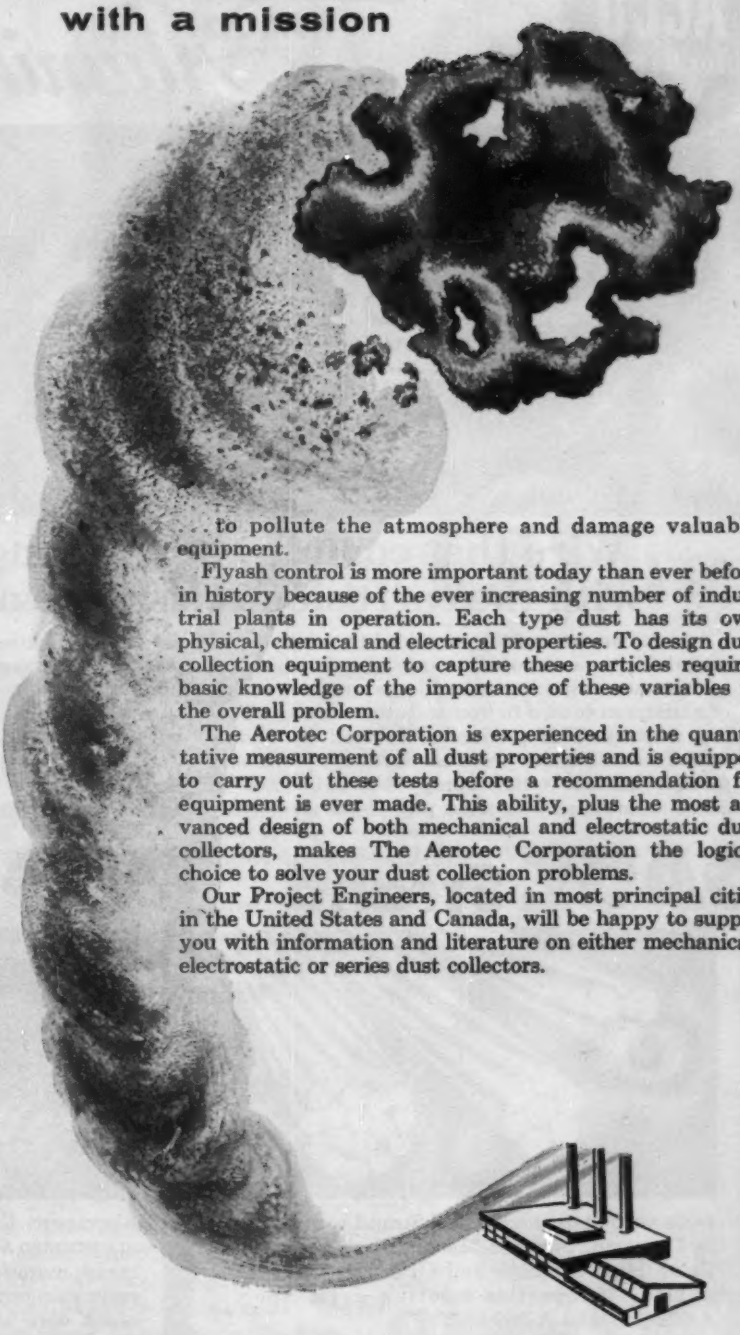
The cart is of welded steel construction, with rubber-wheeled tires and is equipped with a foot brake which locks against both the front wheels.

Columbia Products, Inc, Wrightsville, Pa.

(*More New Products on page* 150)

Dust Particle

with a mission



. . . to pollute the atmosphere and damage valuable equipment.

Flyash control is more important today than ever before in history because of the ever increasing number of industrial plants in operation. Each type dust has its own physical, chemical and electrical properties. To design dust collection equipment to capture these particles requires basic knowledge of the importance of these variables to the overall problem.

The Aerotec Corporation is experienced in the quantitative measurement of all dust properties and is equipped to carry out these tests before a recommendation for equipment is ever made. This ability, plus the most advanced design of both mechanical and electrostatic dust collectors, makes The Aerotec Corporation the logical choice to solve your dust collection problems.

Our Project Engineers, located in most principal cities in the United States and Canada, will be happy to supply you with information and literature on either mechanical, electrostatic or series dust collectors.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
(Offices in 38 principal cities)
Canadian Affiliates: T. C. CHOWN, LTD., 164 Metcalfe Ave., Westmount, Montreal 6, Que.
Manufacturers
THE AEROTEC CORPORATION
Greenwich, Conn.

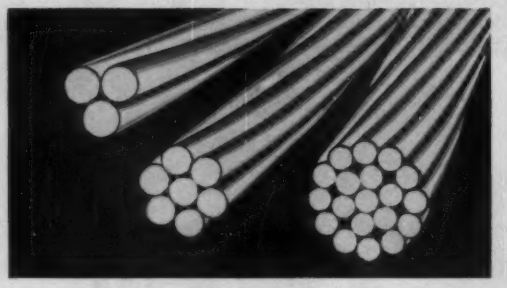
ACCO for Better Values

It's NEW!... ACCO *Aluminized Wire*

Wire that combines the strength of steel with the corrosion resistance of aluminum

• PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents. • Salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.* • Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications; can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. PAGE also now produces ACCO ALUMINIZED ACSR Core Wire for use in conductor cable.

PAGE Strand



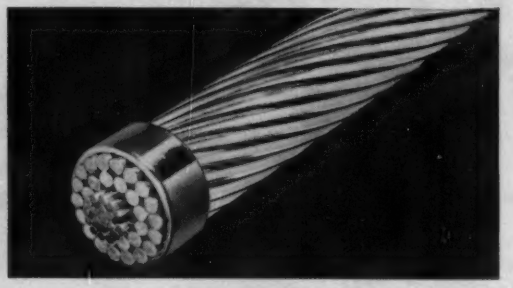
PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54T and A-363-55-T.

NOTE: We will continue to make PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for Booklet DH537-A.

PAGE ACSR Core Wire

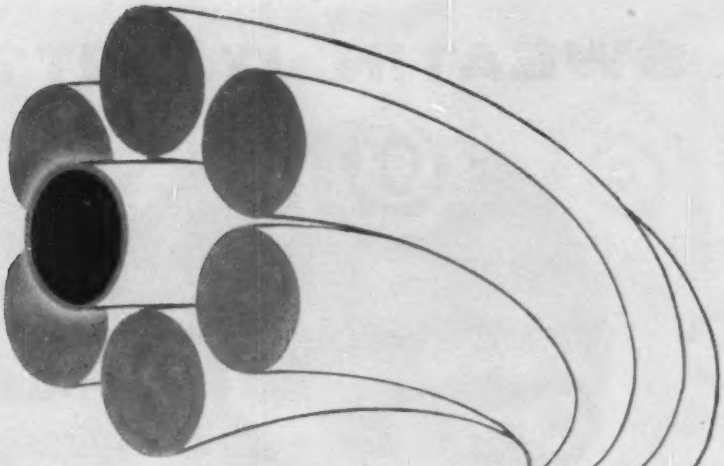


Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable, who early recognized the superiorities of this aluminized wire and encouraged its development. Product quality control is assured by a special testing procedure developed mutually by PAGE and ALCOA.

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO



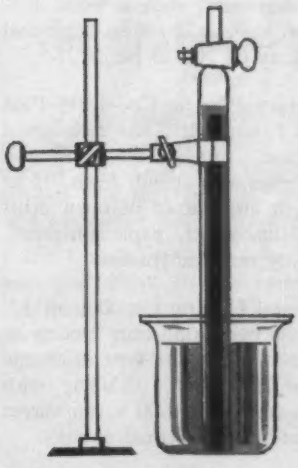
from Alcoa...

ACSR WITH GREATLY EXTENDED CORE LIFE AT NO EXTRA COST

Steel core wire corrosion problems involving dissimilar metals are well on their way to being a thing of the past. Now, thanks to years of cooperative research between Page and Alcoa, you can get ACSR with aluminized steel core wire.

The aluminum strands of the conductor will be stranded around a hot-dip, aluminum-coated steel core. Extensive testing has shown the coating is ductile, adheres tightly to the steel, and steel strength exceeds specification. ACSR with aluminized core wire is a premium product—without a premium price.

reliable quality control test



Alcoa laboratory tests proved that this new development resulted in a good protective coating on steel wire. But before it could be adopted for making Alcoa ACSR, a reliable quality control testing procedure was necessary. A visual check wasn't satisfactory. Results had to be measurable. The test had to prove the integrity of the coating.

A simple test, using a simple apparatus, was developed by Alcoa and Page engineers. It will be used by both Page and Alcoa. It can be used by customers.

Your Alcoa representative has full details on these major developments to combat corrosion problems. Ask him about them or write, ALUMINUM COMPANY OF AMERICA, 2306-E Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ELECTRICAL CONDUCTOR
ALUMINUM COMPANY OF AMERICA

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

SWEATIN' IT OUT?

NEXT TIME - SAVE TIME - CALL ROYAL FIRST!

When you've promised power to people and the new substation has a deadline, you need coordination — and that takes *cooperation.*

Every supplier must come through *as promised,* and sometimes meet "impossible" production schedules. That's when Royal really shines — supplying fine switchgear and connectors to meet the most critical due date. For Royal keeps its operations flexible — gearing them to each individual job and *when it's wanted.*

Whether your job is normal or rush, large or small, you'll like dealing with Royal — for switchgear, any of 5,000 standard connectors, or specially engineered designs. Next time, save time and trouble — order from Royal Electric.

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

More New Products

Westinghouse Electric Corp, Box 2278, Pittsburgh, Pa., has available OV-10 **luminaires** which permit L-H4, A-H22, or C-H5 clear mercury vapor lamps to be used for residential street lighting, with the arc tube in the horizontal position.

Allen B. DuMont Laboratories, Inc, 750 Bloomfield Ave, Clifton, N. J., offers a dial-direct, mobile **radiotelephone system** which automatically switches telephone calls to radio system and radio calls to telephone. Operating on 24-hr basis, it uses no manual operators and only two telephone lines.

B. F. Goodrich Chemical Co, 3155 Euclid Ave, Cleveland 15, Ohio, offers an Air-Loc machine **mounting pad** of polyvinyl resin for industrial electric motor mounts.

Tork Time Controls, Inc, Mount Vernon, N. Y., has momentary contact spdt **time switches** for direct, automatic control of low voltage lighting systems and contactors. Dial may be 24-hr type, skip-a-day, astronomical, or combination.

Simpson Electric Co, 5200 W Kinzie St, Chicago, Ill., offers a Model 632 Low-Ohm-Meter **ohmeter** with a range of 0.1 to 25 ohms, a maximum circuit current of 5 ma, and a reported accuracy of 3% fullscale.

Ramco Equipment Corp, Div of Randall Manufacturing Co, Inc, 1373 Lafayette Ave, New York 79, N. Y., offers a small-scale ultrasonic **degreaser,** with a work area of 9 in. by 9 in. by 6 in. high and a capacity of 100 lb per hr.

Century Electric Co, 1806 Pine St, St. Louis, Mo., has redesigned polyphase, single-phase, and d-c **gearmotors** with speeds from 7.5 to 750 rpm and choice of open drip-proof, dust-proof, explosion-proof, or totally enclosed frames.

General Electric Co, Detroit 32, Mich., is marketing four models of a three-in. diam disc-type discharge **varistor assembly,** 9RV3A, with ratings from 6 to 600 v, for direct installation in electrical circuits.

Yes sir, Penta-treated poles sure are clean and easy to handle

Chuck stood looking at the new pole for a minute, then he took a swipe at it with his hand and held it up for me to see. Told him I didn't see anything, but he replied that was just the point. Said these were the cleanest poles and crossarms he'd ever worked with.

I told Chuck that's because they're treated with Penta, and that Penta-treated wood is clean and easy to handle. Penta keeps rot and termites out, too—makes poles and arms last years longer. That means fewer replacements later on and makes things easier for Chuck and me all the way around.

Chuck said he hoped we'd be using Penta-treated poles and arms from now on. I said we most likely will because they don't cost any more than poles and arms treated with ordinary preservatives.

THE DOW CHEMICAL COMPANY, Midland, Michigan, Department PE 501B.

YOU CAN DEPEND ON DOW

G-E Hook-on Volt-ammeter Helps Avoid Reading Errors

RANGE AND SCALE of this G-E instrument show simultaneously by simply turning the fingertip control knob. Seeing only one range and scale avoids reading errors.

SCREW-IN VOLTAGE LEADS and recessed terminals provide maximum protection for the operator. Voltage leads cannot be pulled out accidentally.

WIDE RANGES ARE AVAILABLE in both models of the G-E hook-on volt-ammeter. Ranges of the AK-4 model are 0-10/30/100/300/800 amperes and 0-150/300/750 volts. The AK-5 ranges are 0-5/20/80/350 amperes and 0-150/300/750 volts. The wider range AK-4 model has a pointer-stop for accurate checking of surge readings.

FOR FURTHER INFORMATION, write Section 582-11, General Electric Co., Schenectady 5, New York and ask for bulletin GEA-6292, or contact your nearest G-E Apparatus Sales Office or Distributor.

GENERAL ELECTRIC

BOOKS

For the Potential Inventor

Patent Notes for Engineers, 7th Edition. By C. D. Tuska. Published by McGraw-Hill Book Co, 330 West 42nd St., New York, N. Y. 192 pages, illustrated. Price $4.00.

Extensive treatment of the legal problems facing the inventor. This book bridges the gap between the inventor and his patent attorney. This new 7th edition has new matter based on the codification of the patent law in 1952.

Although it is not intended to replace the need for patent attorneys, the book does give a clear idea of what patentable inventions are and how to protect them. The book has material on case histories, court decisions, actual patent illustrations, disclosure drawings, and sample application forms.

Electricity for Beginners

Basic Electrical Engineering. By A. E. Fitzgerald and D. E. Higginbotham. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 540 pages, illustrated. Price, $7.50.

This second edition places equal emphasis on circuit theory, machinery, industrial electronics and measurements, and feedback-control systems. It covers the fundamental concepts in an orderly and systematic manner, aided by many illustrations, examples, and problems.

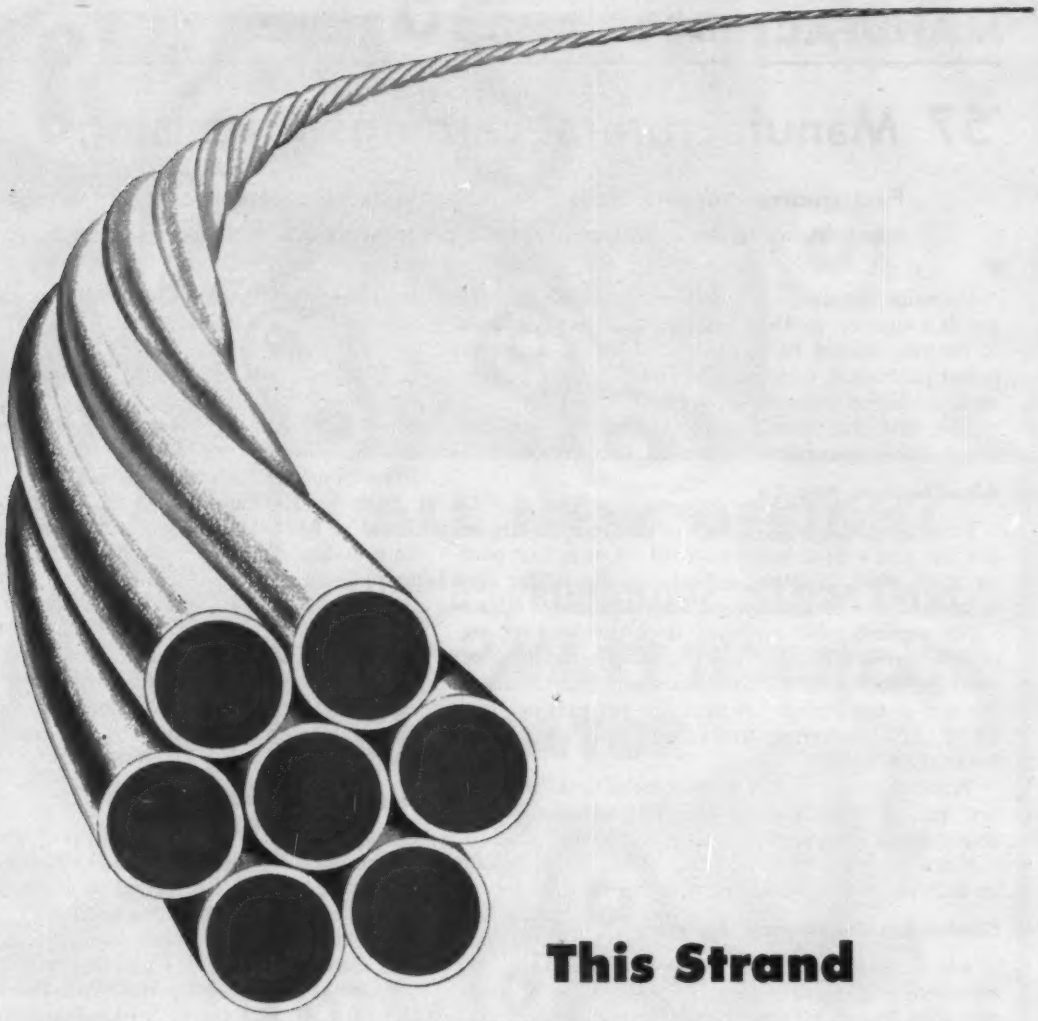
This edition includes new material on control and measurement techniques, circuit theory, machinery, and electronics. It would be useful to a utility conducting a basic course for high school graduates.

An Engineer's Law Book

Legal Problems in Engineering. By Melvin Nord. Published by John Wiley & Sons, Inc, 440 4th Ave, New York 16, N. Y. 391 pages. Price, $7.50.

This book is a broad survey of those aspects of law which most concern the engineer. The author, an engineer and practicing lawyer, first treats various legal principles that bear on engineering, such as contracts, sales, insurance, and property. He then applies these principles to engineering-legal problems such as construction contracts and specifications, air and stream pollution, governmental regulation, patents, and copyrights.

Clear, concise, and well organized, this book uses a minimum of legal jargon. In addition, the court cases that illustrate various legal problems are condensed and readable.



This Strand

Wears a Special Suit of Armor

The zinc coating applied to strand has only one function—to keep moisture and corrosive atmosphere away from the steel wires. Obviously, rust cannot begin its destructive work as long as the coating holds up.

More than twenty years ago Bethlehem developed bethanizing, an electrolytic process that resulted in a tighter bond between coating and wire. An equal advantage was the high degree of ductility achieved. The merits of bethanizing are so widely recognized that bethanized strand has become synonymous with top quality.

Because of the great ductility of the zinc, the coating is virtually immune to checking and peeling. This is true even under deformation. Thus there are no tiny cracks or pits in which rust can gain a foothold. Bethanized strand is protected by an impervious armor that lasts for years.

Complete details are available from the nearest Bethlehem office. Call or write; we'll be glad to supply whatever information you may require.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

'57 Manufacturers' Earnings Promising

First quarter reports from five major makers of electric power equipment indicate that business is still good with unfilled orders increasing

Earnings for major equipment manufacturers for the first quarter of 1957 indicate that the remainder of the year should be promising. Unfilled orders for power generation, transmission, and distribution equipment are higher today than they were a year ago.

The first five manufacturers reporting their first quarterly earnings for 1957 to Electrical World are:

Allis-Chalmers Mfg Co

First quarter sales of $138 million were slightly below last year's $140 million record. Lower first quarter sales were attributed entirely to the slower start in construction machinery and farm equipment sales.

Net earnings after preferred stock dividend requirements were $4,977,062, which amounts to 61¢ per share on the 8,155,852 common shares outstanding at the end of the period. A year ago net earnings were $5,587,320, amounting to 71¢ per share on 233,144 fewer shares.

Percentage of earnings to sales billed is 3.70 for the first quarter of 1957, compared with 4.10 for the corresponding 1956 period.

Unfilled orders at March 31 totaled $250 million, an increase of $76 million from a year ago.

Combustion Engineering, Inc

Net earnings for 1957 will show an increase of approximately 20% over the previous year, it was estimated by Joseph V. Santry, chairman of the board.

First quarter shipments this year, he reported, were $45 million compared with $32 million in the corresponding quarter of 1956. And net earnings amounted to $1,397,000 or 44¢ per share, compared with $1,611,000 or 50¢ per share in the first quarter a year ago. Shipments for the entire year of 1957 are estimated at $200 million as against $169 million for 1956.

"The $13 million increase in 1957 first quarter shipments over the same quarter of 1956," said Santry, "resulted largely from increased shop facilities becoming available for production. Net income was less than the previous year because of additional production costs incurred in placing new facilities in service and because of the additional operating expenditures of the nuclear energy division."

"Although the rate of shipments in the first quarter improved substantially, the backlog also increased, and at March 31, 1957, amounted to $390 million compared with $384 million at Dec. 31, 1956."

General Electric Co

Sales for the first quarter of 1957 amounted to $1,048,900,000, an increase of 11% over the previous first-quarter record set in 1956, and a 26% increase over the first quarter of 1955, stated Ralph J. Cordiner, president. Net earnings for the quarter were $64,006,000, up 16% over comparable 1956 earnings and 22% higher than first-quarter 1955 earnings.

"Prospects for the rest of the year are promising, particularly in view of the unprecedented volume of orders already on the books for power generation and distribution equipment and an uptrend in the company's defense business," Cordiner said.

Sales for 1957 are expected to exceed the previous record of $4,090,015,685 set in 1956 by about 15%, the president continued. He based his expectation on the national economy continuing "to perform as predicted, with a 4% increase in the gross national product."

Cordiner pointed out that General Electric continues to invest more than 6% of its sales dollar in research and development, as compared with an investment of about 2% of sales by the average industrial company.

Sangamo Electric Co

Sales for the first quarter this year were $13,057,000 an increase of 18% over $11,020,000 for the corresponding three-month period in 1956, reports C. L. Clark, vice president and treasurer.

Net income for the quarter was $952,000, up 25% from the comparable 1956 earnings of $759,000.

Earnings per share for the 1957 first quarter were $1.19 for 801,121 shares outstanding as of March 31, compared with $0.95 for the like 1956 period.

Westinghouse Electric Corp

Sales billed in the first quarter of 1957 were $475,686,000, and net income was $14,198,000 equal to 82¢ a common share, reports Gwilym A. Price, chairman and president.

New orders booked in the first quarter were the largest in any first quarter, Price said.

"Although sales billed for the past two quarters have averaged nearly a half billion dollars, negotiations for new business continue very active; and our backlog of orders for apparatus, industrial and atomic products is now at a record level," Price added. Defense business, he said, continues to be substantial while in consumer products Westinghouse, in common with other manufacturers, is experiencing difficult market conditions.

In the first quarter of last year when the company's major plants were affected by strikes, sales billed were $225,366,000. The loss for the quarter was $18,575,000, equal to $1.14 a common share on the 16,647,166 shares then outstanding.

(More M&M on page 156)

ALL NEW DESIGN!

Simple...Foolproof...Low Cost

1500 WATT HOMELITE GENERATOR

Model 35A115
Homelite Generator
1500 Watts, 115 Volt
60 Cycle AC
90 Pounds

Easy to Carry... ...Easy to Use

1. New Money-Saving Features . . . No DC brushes; just two easy-to-get-at collector ring brushes . . . No commutator or DC windings . . . No intermediate couplings; armature keys directly to shaft. Fewer parts to wear out — longer trouble-free generator service.

2. Constant Voltage . . . less than 4% change from no load to full 1500 watt capacity . . . assures long service life for your electric tools . . . guarantees top performance at all times.

3. Overload Capacity . . . 1500 watt continuous duty with generous overload capacity prevents tool stalling under heavy loads . . . insures uninterrupted service even when starting loads exceed operating loads.

4. Compact and Lightweight . . . one man can easily carry this generator wherever you need electricity to power time-saving electric tools. No need for long, hazardous power-consuming cables.

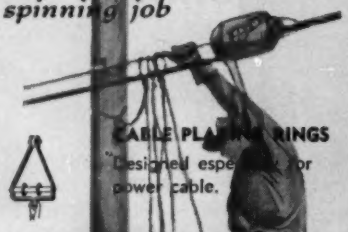
Whatever tools you want to operate — electric soldering irons, drills, floodlights, grinders, hammers, the new Homelite 35A115 generator can save you money. For a free demonstration or additional information, call your nearest Homelite representative.

SAVE EVEN MORE! New Homelite electronic idle control unit, available as optional accessory, runs engine at idle speed when no current is drawn . . . automatically brings engine to full speed when load is applied.

Ask your Homelite representative to show you how this easily-installed accessory reduces engine wear . . . increases service life . . . cuts fuel consumption.

HOMELITE *A DIVISION OF TEXTRON INC*
6105 RIVERDALE AVE., PORT CHESTER, N. Y.
Manufacturers of Carryable PUMPS • GENERATORS • BLOWERS • CHAIN SAWS

EVERY TOOL NEEDED
for the complete spinning job



CABLE PLA[illegible] RINGS
"Designed espe[illegible] for power cable.

[illegible]ING W[illegible]MPS
For holding [illegible] wire prior to te[illegible].

[illegible] CLAMPS
[illegible]rfect tool for supporting splicer's platform.

HAND LINE BLOCK
[illegible] raising material to the pole or messenger.

SLACK PULLERS
Either ratchet handle or slip handle — for pulling slack in the messenger when splicing.

SPINNING WIRE
Copper, copperweld, steel, stainless steel, aluminum, for every need, furnished on returnable metal reels.

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Serving the growing Independent telephone industry
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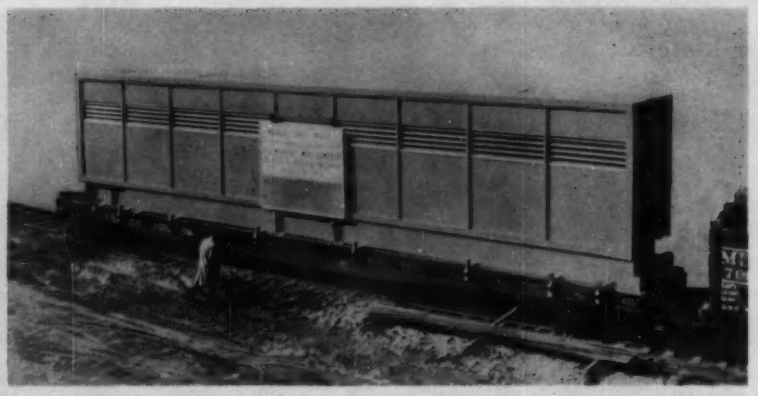

Ship First Gate Hoist to Long Sault Dam

The first of 18 gate hoists manufactured by D. J. Murray Manufacturing Co, Wausau, Wis., for the St. Lawrence power project at Massena, N. Y. was shipped from the plant of the Wausau Iron Works, Inc. Here the fabricated parts were assembled by the manufacturer.

This hoist is to be installed on the Long Sault Dam. Every two weeks after the first shipment, another gate hoist will leave the plant for its destination until the $750,000 shipment is completed.

As illustrated, the hoist was loaded on a special length flat car supplied by the railroad.

Each hoist will weigh 90,000 lb and as shipped will be completely equipped including all electric motors, controls, limit switches and wiring, ready for operation.

Each gate hoist has 175 ton lifting capacity. The hoists will raise and lower the gates in the dam at a speed of 2 ft per min. Over-all length of each hoist is 57 ft, the width 8.5 ft, and the height 12.5 ft.

Delta Star to Market Distribution Transformers

A new product of the Delta Star Electric Division, H. K. Porter Co, Inc, is a line of pole-type oil-immersed distribution transformers. They will be manufactured at the Electric Service Works, Philadelphia.

The line will range from 5 to 167 kva, and up to 15 kv. Designated Type OS, the conventional single-phase, 60-cycle units will have side-tank and cover bushings. The CSP units will be available later, according to a company spokesman.

The designs for all sizes are reported completed. Among the popular ratings immediately procurable are 5 kva, 2400/4160Y-120/240v; 10, 15, 25, 37.5, and 50 kva, 2400/4160Y-120/240v, with four 2½% below taps. Other ratings can be obtained in a short time.

Stewart Beattie, vice president and general manager of Delta Star Division has appointed H. Yale Mageoch general manager of Electric Service Works. Mageoch will head the transformer operation at Philadelphia.

Westinghouse Discontinues Induction Regulators

Manufacture and sale of induction regulators have been discontinued by Westinghouse Electric Corp.

The announcement, which was made by John C. Rissinger, sales manager, power transformer department, coincided with the company's introduction of a new line of step regulators (type URF) in higher ratings (EW, May 6, p 132).

Rissinger said, "We are now able to provide 1¼% step regulators that are completely competitive in the single-phase area, 15 kv and below, where induction regulators have been used in the past."

(*More M & M on page* 158)

Do you worry about conduit space for new control circuits

AFTER EVERYONE'S GONE HOME?

If you have a problem in getting additional control circuits in existing conduits — here's one practical way to solve it — specify and use Rockbestos PNR 600 volt control cable. It will help you get a maximum number of control circuits in a minimum amount of space. Here's why:

- Rockbestos PNR lets you pull a 12 conductor control cable in conduit which is now carrying ordinary six or seven conductor cable.
- It's 46% smaller in area — 28% smaller in diameter than conventional control cable.
- With it you save on conduit and fittings, cut installation costs.
- It's flexible from 167° to −67° F.
- It's light, easy to handle, pull through conduits.

Get the complete Rockbestos PNR story — write now for catalog which gives complete specifications and application data.

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ROCKBESTOS

PNR
Small Diameter
Control Cable

MORE THAN 10,000,000 FEET IN SERVICE

ROLATAPE MODEL 400

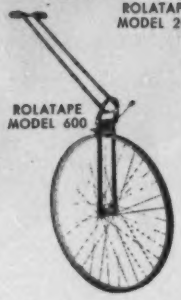
ROLATAPE is the Fast, Efficient, Economical, Modern way to measure. Model #400 is widely used by Road Construction Companies, Telephone Companies, Utilities, Sewage Departments and many other industries where measurements are important.

MEASURING time is cut to a fraction with Rolatape. Model #200 is extremely popular with Real Estate Men, Appraisers, Traffic Officers and many others who demand fast, accurate, measurements.

WHEELS on all Rolatapes are precision calibrated, and can be depended upon for long-life service. Model #600 is a special model for long-distance, acreage measuring and for use over rougher terrain.

ROLATAPE MODEL 200

FOR FAST, ACCURATE measuring—Rolatape Measuring Wheels are the answer. Models #400 and 600 measure distances up to nearly nineteen miles.



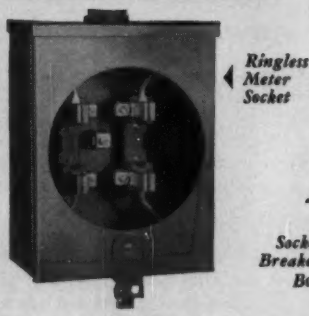
ROLATAPE MODEL 600

MEASURING is simple, time-saving, and efficient when you use a Rolatape. FOR COMPLETE DETAILED ROLATAPE INFORMATION, SEE YOUR DEALER, DISTRIBUTOR, OR WRITE TO:

ROLATAPE, INC.

Factory: 1741 Fourteenth Street, Santa Monica, California

Look to Superior for
SOCKET EQUIPMENT



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Superior also offers a complete line of:
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Catalog 55 offers complete information on features, services, types and sizes. Write to:

L-M Selects Site for New Laboratory

Selection of the site for a million-dollar engineering research laboratory has been announced by Line Material Industries' President R. G. Wheaton. The new facility will be located near the Village of Franksville, west of Racine, Wis. Construction is to start about July 1, 1957, with completion slated for the fall of 1958.

The Franksville building and equipment will replace the present "Know House" in South Milwaukee. Greater test capabilities required for short-circuit testing will be provided by a large high-speed generator. In addition to the short-circuit laboratory, several other units are planned for the Franksville site.

This laboratory is one of the network of "Thomas A. Edison" laboratories being established for Line Material Industries and other McGraw-Edison divisions. The 20,000-sq ft laboratory will be operated initially by about 15 engineering employees.

Orangeburg to Market Flexible Plastic Pipe

Manufacture of SP plastic pipe, another product of Orangeburg Mfg Co, Orangeburg, N. Y., and Newark, Calif., has been started in the company's new plant at Orangeburg. This marks the 64-year-old pipe and conduit manufacturer's entry into the plastic pipe field.

H. J. Robertson, Orangeburg president, said that Orangeburg has entered into an agreement with Allied Chemical & Dye Corp to take the major part of Allied's 1957 production of its new type polyethylene resins.

This new pipe will be available in ½-in. through 2-in. sizes and carries approval for potable water service. Requirements are reportedly met for Commercial Standard CS197-57 for Standard Wall, 75-lb and 100-lb pressure-rated pipe. This plastic pipe is said to retain sufficient flexibility to permit easy laying in the field and to be available in coil lengths up to 400 ft.

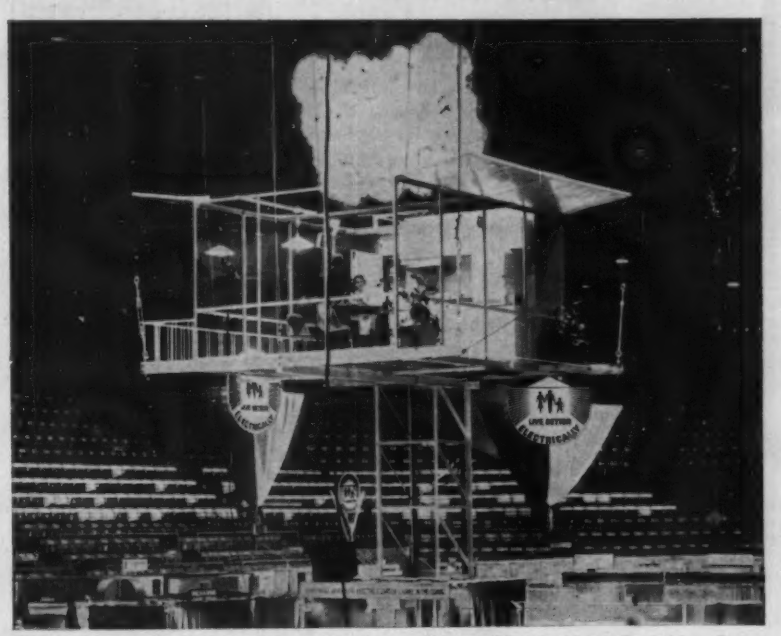
(More M&M on page 160)

LIVE BETTER ELECTRICALLY SPARKS CONSUMER BUYING IN CINCINNATI

Electric Living Exposition launches Spring sales drive

More than 125 manufacturers, dealers and distributors recently took part in Cincinnati's Electric Living Exposition and used Live Better Electrically as their dominant merchandising theme. Co-sponsored by Cincinnati Gas & Electric Co., three local newspapers and The Electrical Association, the Exposition launched the utility's spring sales drive with profitable results for all who participated.

Under the leadership of J. R. Hartman, Vice President of C.G.&E. and E. E. Hodgetts, the utility's director of promotion and advertising, the Exposition was developed as the focal point of a tremendous city-wide drive.



"Home in the Clouds" hung suspended from ceiling at Electric Living Exposition. It was equipped with all the latest in electrical living. More than 3,500 married couples entered contests to live alternately in the "Home in the Clouds," and winners received free electrical appliances.

COMPLETE COVERAGE BY TV, PRESS

Three TV and seven radio stations heralded the Exposition with free publicity and the three major newspapers devoted over 40,000 lines of editorial space to the promotion while generating over 60,000 lines of local advertising. Twenty suburban newspapers also lent their full support to the drive. In addition to heavy advertising and publicity, key department stores featured Live Better Electrically in their window displays, and the entire electrical industry worked together to sell electrical living in every conceivable way.

It was the first time in 17 years that Cincinnati's electrical industry was brought together for such a large-scale promotion.

DISPLAYS SPARK EXTRA SALES

All the exhibitors at the Exposition were enthusiastic about the public's response and pointed out that Live Better Electrically helped create a real shopping mood. The majority of visitors were genuinely interested in buying the products displayed and demonstrated. One dealer put it: "We think the show was very successful, both from the standpoint of contacts and sales we made and the enthusiasm shown by the public." An exhibitor reported "enough sales leads to keep us busy for the next six months," and another added that he "increased store traffic and sales as a direct result of the display." Other typical reactions: "We received excellent exposure per dollar spent". . ."Very happy with the results and exposure of our products". . ."Invaluable consumer exposure". . ."Interest shown in products far exceeds expectations." Exhibitors were so pleased with the results that many of them have requested a repeat performance of the Exposition next year.

Here's how Ed Hodgetts sums up the thinking behind this Live Better Electrically event: "Automobile, homebuilding, fashion and other industries all have their own shows to compete for the consumer dollar. If the electrical industry sits back and does nothing, they'll never get their share." That's why C.G.&E. is so enthusiastic about the outstanding results of all of their Live Better Electrically promotions.

Why not investigate the promotional possibilities of Live Better Electrically in *your* area?

LIVE BETTER
...Electrically

LIVE BETTER ELECTRICALLY

A united effort by everyone in the electrical industry—utilities, manufacturers, dealers, and distributors, builders, contractors—to increase residential load and the sales of electrical merchandise.

PLYMOUTH RUBBER COMPANY'S PLASTIC ELECTRICAL TAPE RULED NOT TO INFRINGE MINNESOTA MINING

Following two years of court action in a patent suit brought by Minnesota Mining & Mfg. Co., the United States Court of Appeals for the Fourth Circuit has ruled that Plymouth Rubber Company's PLYMOUTH PLASTIC ELECTRICAL TAPE *does not* infringe the 3M Patent No. 2559990, and further ruled invalid the added claims on reissued Patent No. RE23843, if construed to cover such Plymouth tape.

To our many friends in the electrical and allied industries, we wish to express our thanks for their confidence and encouragement during these arduous court proceedings, and we pledge to continue manufacturing the finest plastic electrical tapes made.

PLYMOUTH RUBBER COMPANY, INC.

Manufacturers since 1896

CANTON, MASSACHUSETTS

Chevrolet Producing 4-Wheel Drive Trucks

Chevrolet Motor Div, General Motors Corp, Detroit, is producing 12 models of 4-wheel drive trucks at its Willow Run Truck Plant, according to Herman P. Satiler, assistant general sales manager for commercial cars and trucks.

The new 4-wheel drive vehicles are designed to meet the demands of specialized truck users by supplying the additional power and traction demanded by many off-highway operations. They will be available in the Carryall; the half, three-quarter and one-ton pickup; one-ton panel; and three-quarter and one-ton stake truck models.

One suggested use for the all-wheel drive unit is a line maintenance vehicle for utilities.

The power is supplied through a four-speed transmission, then "split" between the front and rear wheels through a two-speed transfer case. Front wheel drive may be engaged or disengaged at any time without using the clutch, provided the transtenance vehicle for utilities.

Now It's Union Carbide

Union Carbide Corp is shortened name, effective May 1, of Union Carbide and Carbon Corp, New York. Also names of three divisions have changed—Union Carbide Chemicals Co instead of Carbide and Carbon Chemicals Co; Linde Co instead of Linde Air Products Co; and Union Carbide Realty Co instead of Carbide and Carbon Realty Co.

Signs along the lines of *Crapo* **GALVANIZED STEEL STRAND PERFORMANCE**

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

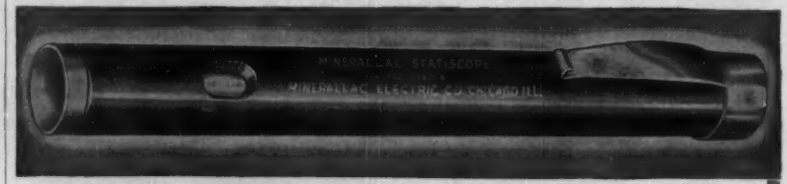
INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

Whether a Winch *Line Hook or a complete Line Body check your requirements with*

UTILITY TOOL & BODY CO.

CLINTONVILLE, WISCONSIN

BUILDERS OF DEPENDABLE EQUIPMENT SINCE 1923 UT&BCo



"VOLT-TELLING STATISCOPE" protects worker

. . . when held in any alternating electrical field. Indicates presence of voltage in AC and Pulsating DC Circuits and in various electrical apparatus. . . . Pocket-size illustrated above, also in Station and Overhead Extension types. Thousands in use. Order from Electrical Jobber. Send for new literature.

MINERALLAC ELECTRIC COMPANY

MANUFACTURERS OF STATISCOPES, HANGERS, CLIPS, STRAPS, INSULATING AND CABLE-PULLING COMPOUNDS

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COMPLETE-PACKAGED...

OBSTRUCTION LIGHTING CONTROL and LAMP FAILURE ALARM UNITS

for unattended TELEPHONE COMPANY MICROWAVE RADIO-RELAY stations.

— by HUGHEY & PHILLIPS, INC.
— your most dependable source of Obstruction Lighting Equipment
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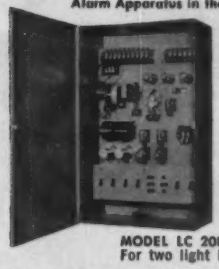

MODEL LC 2082
For two light levels

MODEL LC 2081 — for single light level
MODEL LC 2083 — for three light levels.

These units provide a separate signal for failure of each top lamp and include maintenance-test switches. Also available with photo-electric control for tower obstruction lights.

Write today for information regarding your specific problems.

HUGHEY & PHILLIPS, INC.
Manufacturers of
300 MM Beacons, Obstruction Lights, Photo-Electric Controls, Beacon Flashers, Special Junction Boxes, Microwave Tower Light Control & Alarm Systems, Remote Lamp Failure Indicator Systems, and complete kits for: Tower Lighting, Sleet Melter Power & Control.
3200 NORTH SAN FERNANDO BLVD.
BURBANK, CALIF.

FOA Cooling Has Advantages

(Continued from page 89)

Reliability of external cooling equipment is an exacting requirement for forced-oil-cooled power transformers. If enough engineering effort, manufacturing cost, and assembly care are applied to each pump and motor, they can be as reliable as the basic transformer. Each motor and pump can cost as much as an automobile without seriously distorting the economics favoring forced-oil cooling.

Although the probability of a good pump and motor getting into operating difficulty is slight, the consequences would not be serious. The smallest forced-oil-cooled transformer has a minimum of two pumps and coolers and could carry at least 70% load continuously without exceeding normal operating temperatures after loss of one pump and cooler. Units in the 30,000 to 50,000-kva range would have three pumps and the loss of one would permit about 90% load continuously at normal operating temperature, or full load at only slight increase in temperature. For units above 50,000 kva, the loss of one pump would scarcely be noticeable on winding temperature indicator.

FOA Has Dollar Advantage

What if fan and pump power should be lost? This is quite improbable but, theoretically, could occur. If it should, forced-oil-cooled units will carry full load for at least 1 hr without damage. Specific provisions to assure freedom from loss of pump and fan power, or to avoid serious consequences if this loss should occur, are available and can be provided where essential.

Even the smallest available forced-oil-cooled transformer (20,000 kva) has several thousand dollars evaluated economic advantage over any other cooling method. At 100,000 kva the FOA advantage is around $50,000. It seems likely that these substantial economic benefits, supplemented by nearly 20 years of very satisfactory operating experience, warrant the prediction of continuance of the distinct trend toward almost universal acceptance of forced-oil cooling for large power transformer applications.

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CURRENT TRANSFORMER FIELD TEST SET

- Check your current transformer installation quickly with this NEW TESCO instrument; pinpoint sources of possible trouble in short-circuiting, faulty connections, instrument tampering, and grounding.
- A special new feature now available in this instrument is the spread of resistance burdens — .5, 1, 2 or 4 ohms. The lower burden values are recorded for testing the small size low capacity current transformers, which are widely used on low voltage installations.
- 2½" panel instrument is easily read. Transparent unbreakable plastic cover. Overall dimensions 6⅞" x 5¼" x 3⅛" high. Weight 2¾ pounds.

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA

- *For full information, write for Bulletin No. 54-B*

Drivers get set to "hit the road" with the first of the 1000 new Power Giants ordered by Ryder System, Inc.

Dodge awarded 1000-truck order

"We picked these Dodge Power Giants to give our truck-lease customers the finest hauling and delivery operation at lowest cost", James Ryder (right), president of Ryder System, Inc., tells Lee F. Desmond, vice president of Dodge.

Ryder System, Inc., world's largest exclusive truck-leasing company, puts low-cost operation first... picks Dodge for record order

When your business is leasing trucks, there's only one way to make it pay off. And that's by keeping your operating costs per mile at rock-bottom levels. That's why Jim Ryder, president of Ryder System, Inc., decided on Dodge when he needed new trucks. He knew that Dodge trucks are built to take extra miles without extra costs.

For instance, new Dodge *Power Giant* V-8's are the most powerful of the low-priced three. And that extra power lets you handle the ruggedest hauling jobs with less engine strain. Less strain means less wear and, of course, fewer repairs. Exclusive Power-Dome design delivers premium performance on regular gas, too. "I save money both ways", says Jim Ryder. "But more important, I know that my customers will be thoroughly satisfied with any Dodge *Power Giant* they lease."

Why not do as Jim Ryder did . . . check into the facts with your Dodge dealer. You'll find a Dodge *Power Giant* will pay off for you, whatever your business.

DODGE

PowerGiants

Most Power of the Low-Priced 3

ELECTRICAL BUSINESS OUTLOOK

Electrical World
MAY 13, 1957

Residential sales look healthy. February sales were up 9.1% above the same month a year ago, the Federal Power Commission reports. And, you'll recall, there was an added day in '56 from Leap Year.

And FPC figures for net income also look good. Class A and B electric utilities show a 10.3% increase in net for February. The $142.34-million total (vs $128.99 million for the month last year) is the best showing since last June.

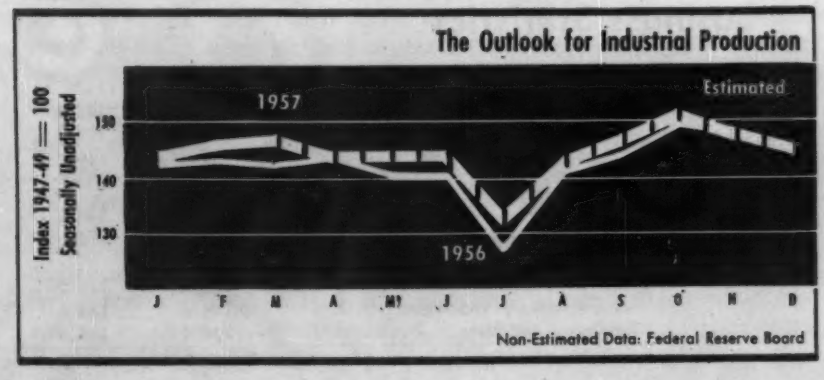
Peak load forecasts will keep edging downward. Tight money, fewer housing starts, tightening up in other industries contribute to minute reductions in peak estimates. In February, FPC showed outlook for December peak this year was 113.5 billion kwhr, a drop of 0.2% from January's estimate. Back in November, utilities foresaw a late '57 peak of 114.8 billion kwhr.

Federal Reserve Board is putting fresh starch in its policy on bank credit. It's the Board's view that specter of inflation is still haunting the outlook. Combined demand from government, individuals, and industry for both short and long-term funds is straining against savings. And the Fed feels if it makes funds available demand for goods will strain against industry's productive capacity. Some are producing well below capacity now, but the Fed thinks pressures are strong enough that it must tighten credit or risk higher prices.

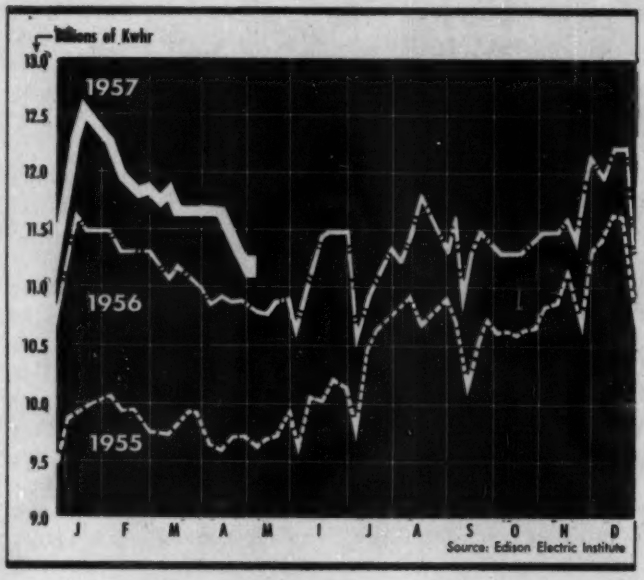
Credit supply-and demand picture appeared to be coming into good balance a few months ago. There was some easing in interest rates. But the Treasury's new issues, that are going at the highest rate since 1933, reflect recent tightening.

One big question: Will tightness put a crimp in business capital expansion plans? Answer is that it may have some effect, but not serious. Corporate profits picture is not encouraging. Profits last year ran $21.5 billion—a slight gain over 1955. But higher dividend payments meant that undistributed profits ran $9.5 billion, or slightly under 1955. Profits in first quarter of '57 will probably show better than last year, but this is partially due to circumstances that may not be duplicated—heavy oil shipments to Europe, for instance.

On the other hand, corporate depreciation and amortization funds have been rising at better than $1½ billion a year. And long term capital markets have absorbed new security issues easily. New issues for corporate construction in first 18 weeks amounted to $2,238 million, against $1,328 million for same '56 stretch.



STATISTICS



OUTPUT
Week ended May 4, 11,286,000,000 Kwhr Up 4.4%

Per Cent Change From Previous Year

	Apr. 20	Apr. 27	May 4
Total U. S.	+ 5.4	+ 4.1	+4.4
New Eng.	+ 1.1	+ 0.6	+1.7
Mid. Atlan.	+ 1.6	0.0	+3.0
Cent. Ind.	+ 3.0	+ 1.4	+1.8
West Cent.	+ 7.1	+ 3.4	+3.3
Southeast	+ 5.4	+ 5.8	+6.8
South Cent.	+11.9	+12.3	+6.2
Rocky Mount.	+ 8.8	+ 7.0	+3.1
Pacific			
NW	+10.9	+11.1	+5.1
SW	+10.9	+ 4.1	+9.2

Seasonally Adjusted Index 224.2
Week Ago 223.5
Year Ago 215.0

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 4.6%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Feb.	121.33	121.20	115.59	5.0
Peak—Class 1 Systems. million kw	Feb.	98.8	103.8	94.2	4.9
Estimated Dec. '57 Peak	Feb.	113.5	113.7	113.6	− 0.1
Production—billion kwhr	Feb.	48.67	55.50	47.99	1.4
Hydro		9.98	10.19	10.63	− 6.1
Fuel		38.69	45.31	37.36	3.6
Sales—billion kwhr	Feb.	47.78	49.15	45.41	5.2
Residential		14.25	14.44	13.06	9.1
Commercial		7.49	7.54	6.91	8.4
Industrial		23.65	24.68	23.20	1.9
Other		2.40	2.49	2.24	7.1
Fuel Consumption	Feb.				
Coal—million tons		13.21	15.98	13.44	− 1.7
Oil—million barrels		6.96	9.90	7.10	− 2.0
Gas—million cu ft		83.24	74.77	67.81	22.8
Net Income Class A & B Co's—million	Feb.	142.34	123.86	128.99	10.3
Residential Customers—millions	12 mos.	45.81	45.71	44.50	2.9
Revenue per kwhr	ended	2.59¢	2.60¢	2.64¢	− 1.9
Avg kwhr per customer	Jan. 31	2,985	2,969	2,778	7.5
Avg annual bill		$77.31	$77.19	$73.34	5.4

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Mar.	148	147	143	3.5
ENR Construction Cost	April	148.7	148.6	143.2	3.8
BLS Cost-of-living	Mar.	118.9	118.7	114.7	3.7
New Orders for Machinery (1950 = 100)	Feb.	158	152	161	− 1.9
NEMA Sales					
Insulation materials	Feb.	146	154	163	−10.4
Electric appliances		94	96	109	−13.8
Wholesale prices	Feb.				
Motors and generators		140.2	140.2	126.6	10.7
Transformers and regulators		146.6	146.6	131.2	11.7
Switchgear and fuses		164.4	164.4	147.5	11.5
GNP—annual rate—$ billion	1st Qtr.	427.0	423.8	403.4	5.9%

MANAGEMENT BULLETIN

FINANCE

New security offerings for electric utility companies were heavy last week. More than $56 million were offered. The first was by Halsey, Stuart & Co group which began offering $25 million Cincinnati Gas & Electric first mtg 4⅛% bonds (Aaa) due 1987 at 99.25% to yield 4.17%. The group had won them with a bid of 98.5899% . . . El Paso Electric Co is offering 119,522 common shares to its stockholders on 1-for-15 basis, record May 7, to expire May 21 at $22 a share. Stone & Webster Securities Corp group is the dealer-manager of the offering. (For later financing see p 19).

More new financing is in the offing. These electric utilities plan to sell bonds: Holyoke Water Power Co, $37.4 million; Boston Edison Co, $25 million; Metropolitan Edison Co, $19 million; Northern States Power Co, $10 million; Puget Sound Power & Light Co, $20 million; Delaware Power & Light Co, $15 million, and Community Public Service Co, $3 million. These companies plan preferred stock sales: Niagara Mohawk Power Corp, 200,000 shares of $100 par stock, and San Diego Gas & Electric Co, $7.5 million late in 1957. Virginia Electric & Power Co is expecting to sell one million shares of common stock.

RATES

Here's the rate situation in Tacoma, Wash. Ford, Bacon & Davis has already recommended a 4-5% rate increase to put City Light on "a sound financial basis." City Light engineers have been studying the rate situation for the past year. Study will soon be finished. City Light officials are talking of a 5-6% hike toward the end of the year. A 6% increase, according to City Light statisticians, would cost the average residential consumer about 44¢ more a month.

Latest on the Arkansas Power & Light Co rate increase. Two utility consultants, one hired by the PSC and the other by the company, estimate that the company needs $4,180,728 a year more for a 6% rate of return. Commission hearing has been set for May 10. Arkansas P&L's Pres R. E. Ritchie said he would have no comment on the findings until the hearings.

ACQUISITIONS

Puget Sound Power & Light Co plans to exchange property. Ellensburg, Wash., City Council votes to buy the distribution lines inside the city owned by the company. Agreement also includes the sale to Puget of some municipal lines outside the city, including a 7,200-v line feeding the city wells. City will pay the company $151,075, financed by a revenue bond issue.

Pembroke, Ont., Town Council is planning to take over the town's distribution system now owned by the Pembroke Electric Light Co, Ltd.

LEGISLATION

Wyoming's municipally-owned electric plants are subject to property taxation. So ruled Attorney Gen Bruce Badley when he said "It is generally conceded that a city which enters the field of private competitive business for profit . . . forfeits its immunity from taxation." Decision is expected to touch off a court case by one or more of the 15 communities owning their own power plants.

A New York legislative bill that would have required the State Power Authority to make payments in lieu of taxes on the proposed Niagara project to local governmental units has been vetoed by Gov Averell Harriman.

Utility relocations bills are still holding the spotlight. Colorado Gov Steve McNichols, a Democrat, vetoes bill requiring use of state and federal highway funds for relocating utility lines on road construction projects. Measure had been adopted by recent Democrat-controlled legislature . . . Maine's Senate passed an order asking the State Supreme Judicial Court for an advisory opinion as to

the constitutionality of a legislative bill which would require the state to reimburse public utilities for the cost of moving their facilities when necessitated by interstate highway construction projects . . . New Mexico State Highway Engineer L. D. Wilson said he would seek a state attorney general's opinion on the constitutionality of a new state law requiring the State Highway Department to reimburse utilities for the cost of moving their facilities when necessitated by highway construction projects.

AREA DEVELOPMENT

New England is a growth area. So said Floyd D. Campbell, president, New England Gas & Electric Association, recently. "The departure of textile and shoe plants from New England," he said, "left available skilled labor ready to develop new industries and the diversification of New England industry which has taken place in the last 15 years has emphasized this change."

"53 of the Top 70" is the headline of an ad that Public Service Electric & Gas Co is now running. These 53 blue chip industries are located in New Jersey which means that they are at the "Gateway to World Markets," the advertisement says.

BUSINESS DEVELOPMENT

"We of Pennsylvania Power & Light Co recognize that our company's prosperity is indissolubly linked with that of the area we serve . . . We will recommend to our customers only those uses of electric service which increase efficiency, production or profit in their businesses or enrich living in their homes." This was part of opening credo in Pennsylvania P&L's booklet entitled "CEP for CEP" covering 1957 Business Development Program. For copy, write R. C. Swartz, vp, PP&L, Allentown, Pa.

PUBLIC RELATIONS

"Statement of Company Policy" has been prepared by the Iowa-Illinois Gas & Electric Co. Statement is a description of the objectives of the company and rules it aims to follow. For copy write Charles H. Whitmore, president, Iowa-Illinois G&E, Davenport, Iowa.

Utah Power & Light Co uses a clever gimmick. In its March issue of "The Circuit" to employees it inserted a card titled "Feel Like You're in an Isolation Booth When Quizzed About Your Company." Just punch out the handy-sized card "Fingertip Facts" about the company. It will supply the answers when memory fails. It will fit in your wallet or pocketbook.

Here's two more ideas you may want to try! The first is that Southern Indiana Gas & Electric Co's Pres A. B. Brown sent out a "thank you" note to each of his stockholders for sending a proxy to the annual meeting. . . . The other is an "Abbreviated Annual Report for 1956" put out by the Toledo Edison Co to its employees. It contains results of company's operations for 1956 as compared with 1955, securities outstanding, 10-year growth in electric sales and revenues.

NEW BOOKLETS

EEI's 24th Statistical Bulletin for 1956 will soon be ready. Edison Electric Institute has announced that this report will become available during the early part of June. It covers the following: Generation, energy sales, customers, revenues, operating data and ratios, financial, farm data, and economics of the electric utility industry. For copies, write, George Payne, Statistical Director, EEI, 420 Lexington Ave, New York 17. Cost will be $1.25 for each copy.

"Statistics of Electric Utilities in the U. S., 1955, Publicly-Owned" has just been released by the Federal Power Commission. For copy write FPC, Washington, 25, D. C. Order number is FPC-S-125.

Kansas Gas & Electric meets high summer peaks with new 100,000-kw unit

The last decade has seen more than a tripling of Kansas Gas and Electric's load, spurred by a recent trend to much higher summer peaks. This trend began in 1954 when hot weather hit Southeastern Kansas. Due to air conditioning and other hot weather loads, K. G. & E.'s summer peak soared 26.8% higher than the previous year. Residential kilowatt-hour sales for the entire year were 29.8% greater than 1953, far more than the national average gain. This trend of rapidly increasing summer load continued at a similar rate through last year.

Kansas Gas and Electric engineers have consistently met this challenging situation by staying ahead of their requirements through forecasting and planning. Their latest step has been the addition of unit No. 3, a 100,000-kw General Electric steam turbine-generator, to K. G. & E's Murray Gill Station. By purchasing General Electric, Kansas Gas and Electric received the benefits of General Electric Power Plant Services . . . saving time, money, manpower.

FOR MORE DATA TURN PAGE ▸

MORE POWER TO AMERICA

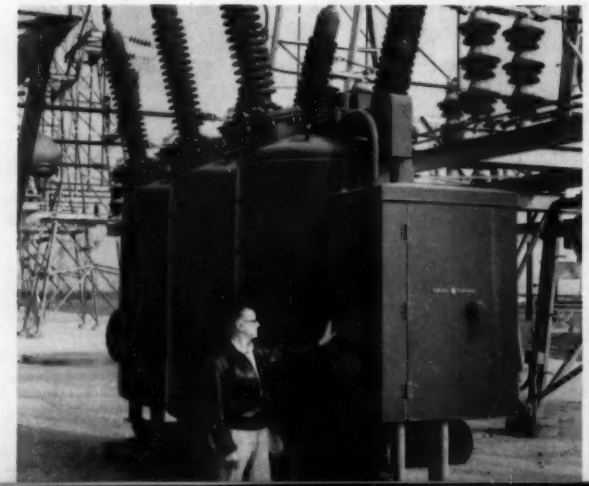
GENERAL ELECTRIC

POWER PLANT SERVICES REPORT

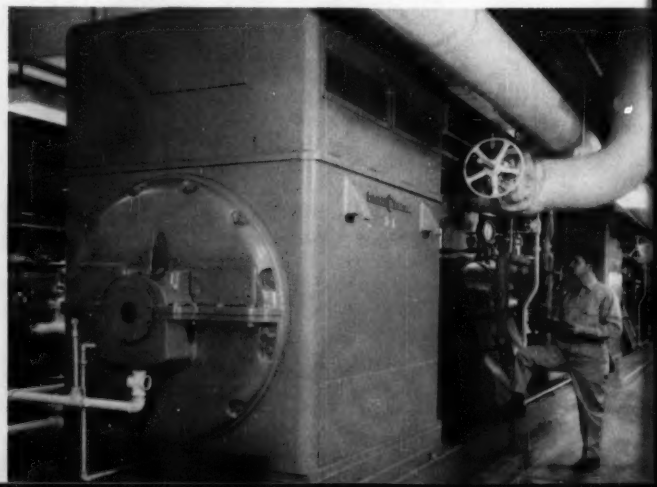
Teamwork of

GREATER CAPABILITY to meet load growth is provided by Murray Gill Station unit No. 3, a General Electric tandem-compound, double-flow, reheat steam turbine-generator rated 100,000 kw. K. G. & E.'s A. W. Hall, Station Sup't.; H. W. McCall, Ebasco Services, Inc.; and G.E.'s R. C. Danford discuss operation of the new unit.

HIGH SPEED OPERATION of General Electric Type FK, 138-kv, 3500-mva oil circuit breakers provides system stability and full protection of electrical equipment.



REDUCED SOUND LEVEL is achieved through acoustic treatment of new G-E 1750-hp, 2300-volt boiler feed pump motors. Three such motors serve Murray Gill Plant.



K. G. & E., Ebasco, and General Electric Boosts Murray Gill Plant Capacity 91%

On-schedule, minimum cost installation achieved through integrated planning

The Murray Gill Station's capacity was increased to accommodate general load growth characterized by high summer loads. K. G. & E. planners decided to get the new unit on the line before the summer, making most advantageous use of it immediately. This necessitated careful planning and a large measure of utility-consultant-manufacturer co-ordination.

PRE-INSTALLATION PLANNING

To a large extent, co-operative pre-installation planning made possible the smooth, relatively rapid, on-schedule installation of all electrical apparatus. It was an example of highly-efficient manufacturer-engineering co-ordination. General Electric Power Plant Service engineers assisted Ebasco and K. G. & E. engineers in applying equipments and fitting their functions to the station's needs. The result was an installation made economically, and with no serious complication. Kansas Gas and Electric planning includes addition of another 100,000-kw General Electric turbine in the near future. And, as in the case of Unit. No. 3, apparatus will be General Electric for standardization and simplification.

MANY BENEFITS

This is typical of the many ways in which General Electric Power Plant Services can assist on your job. These services consist of application engineering, product development engineering, field service engineering, and power plant co-ordination which help to:

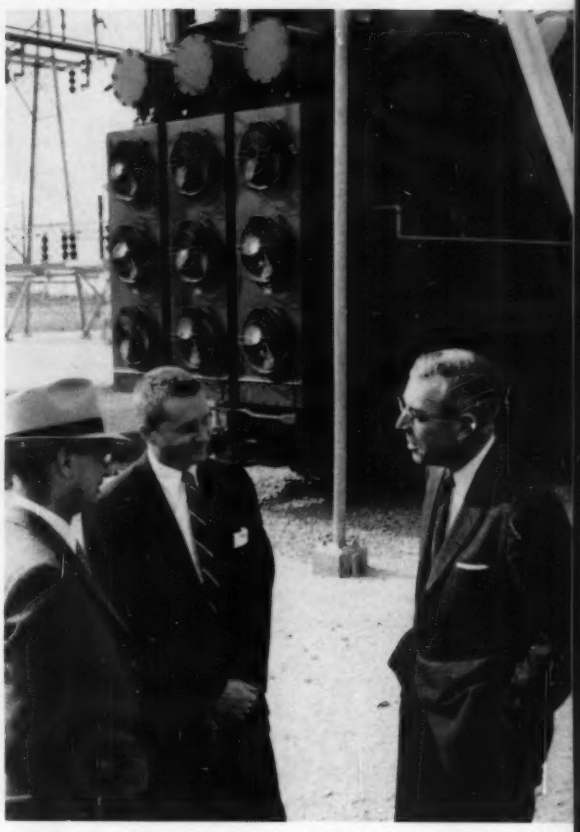
- SIMPLIFY ORDERING OF EQUIPMENT
- CONSERVE ENGINEERING TIME
- INTEGRATE EQUIPMENT DESIGN
- SPEED CONSTRUCTION
- ASSIST IN TRAINING OPERATORS

For full information on these Power Plant Services, contact your General Electric Apparatus Sales Office or write for 28-page bulletin GEA-6320 to General Electric Company, Section 302-17, Schenectady 5, N. Y.

FOR MORE DATA TURN PAGE ▸

MORE POWER TO AMERICA

GENERAL ELECTRIC



TIME WAS SAVED in installation by shipping this G-E Type FOA-T, 125,000-kva power transformer upright with unit coolers in place. K. G. & E.'s E. D. St. John, (left), Sup't. of Production, and S. J. Sickel (right), Vice-president—Operations, confer with General Electric Sales Engineer C. S. Clark.

INTEGRATED ENGINEERING was key to smooth, on-schedule installation of unit No. 3. In this planning conference are (left to right) S. J. Sickel, K. G. & E.; W. O. Harris, Ass't. Construction Mgr., Ebasco; E. D. St. John, K. G. & E.; and C. S. Clark, G.E.

ENGINEERING TEAMWORK saved time and money. At this meeting in Ebasco's New York office, (left to right) R. R. Bennett, Ebasco Mech. Engr.; D. T. Warner, G-E Sales Engr.; F. A. Ritchings, Ebasco Chief Mech. Design Engr.; R. H. Crone, Ebasco Elect. Engr.; and G. Spillane, G-E Application Engr. discuss Station's equipment needs.

General Electric application engineers help assure on-time start-up

Speed and reduced costs result from early, integrated planning

In the case of Kansas Gas and Electric's addition of unit No. 3 to the Murray Gill Station, co-operative engineering between manufacturer, consultant, and utility was highly successful. The early conferences between General Electric application engineers and Ebasco engineers helped Ebasco design and construct the most efficient and economical station for K. G. & E.'s needs.

When manufacturer and consulting engineer sit down at a planning conference, a great variety of highly specialized skills is brought to bear on selecting the proper electrical apparatus to provide maximum effectiveness and flexibility of your power station. For the manufacturer's contribution to this team, General Electric assigns a staff of engineers representing many years' experience in providing General Electric Power Plant Services.

As requirements in power station equipment grow to higher ratings, improved efficiencies, and even greater reliability, the advantage of selecting General Electric apparatus, combined with time-saving, money-saving General Electric engineering teamwork, offers electric utilities increasing reason to call in General Electric early when planning a new station.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

MEETINGS CALENDAR

MAY

Edison Electric Institute—Hydraulic Power Committee, Highland Hotel, Massena, New York, May 13-15; Industrial Relations Committee, EEI Headquarters, New York City, May 16; Electrical System and Equipment Committee, Statler Hotel, Buffalo, N. Y., May 20-21.

Industrial Nuclear Technology Conference—Museum of Science and Industry, Chicago, Ill., May 14-16.

Pacific Coast Electrical Association—Annual Convention, Fairmont Hotel, San Francisco, Calif., May 15-17.

Pennsylvania Electric Association—Relay Committee, Bedford Springs Hotel, Bedford Springs, Pa., May 16-17; Systems Operation Committee, Skytop Lodge, Skytop, Pa., May 23-24.

New York State Society of Professional Engineers—1957 Engineering Industries Exposition in connection with its annual convention, Statler Hotel, New York City, May 16-18.

National Electrical Manufacturers Association—Dry Process Electrical Porcelain Section Meeting, Hotel Cleveland, Cleveland, Ohio, May 17.

American Institute of Mining, Metallurgical and Petroleum Engineers—Eleventh Annual New England Regional Conference, Hotel Statler, Boston, Mass., May 17-18.

American Institute of Electrical Engineers—Eighth Annual Appliance Technical Conference, Rockingham Bldg., Detroit, Mich., May 20-21.

• **Kansas Farm Electrification Council**—2nd Farm Power Use Conference, Wichita, Kans., May 21.

American Public Power Association—Lake Placid Club, Lake Placid, N. Y., May 21-23.

National Association of Electrical Distributors—49th Annual Convention, Sheraton Park and Shoreham Hotels, Washington, D. C., May 26-29.

JUNE

Electric Companies Advertising Program—Management Group, Palmer House, Chicago, Ill., June 2.

Electric Companies Public Information Program—Steering Committee, Palmer House, Chicago, Ill., June 2.

Eighth Annual Conference on Industrial Research—Sponsored by the Department of Industrial and Management Engineering of Columbia University, Arden House, Harriman, N. Y., June 2-7.

American Management Association—General Management Conference, Statler Hotel, New York, N. Y., June 3-5.

American Society of Refrigerating Engineers—53rd Annual Meeting, Hotel Fontainbleau, Miami Beach, Fla., June 3-5.

Edison Electric Institute—Annual Convention, Palmer House, Chicago, Ill., June 3-5.

National District Heating Association—48th Annual Meeting, The Homestead, Hot Springs, Va., June 3-6.

Electric Association—Chicago Electrical Industry Show, Conrad Hilton Hotel, June 4-6.

American Institute of Electrical Engineers—Industrial Power Rectifiers and Semiconductor-Metallic Rectifiers Committees, Morrison Hotel, Chicago, Ill., June 4-5; Summer General Meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, June 24-28.

American Society of Mechanical Engineers—Semiannual Meeting, Sheraton-Palace Hotel, San Francisco, Calif., June 9-13.

• **Public Utilities Association of the Virginias**—Accident Prevention Conference, Daniel Boone Hotel, Charleston, W. Va., June 14; Sales and Publicity Committees, Charlottesville, Va., June 20-21.

American Society for Testing Materials—Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-21.

Industrial Management Center — Fourth Annual Material Handling Training Conference, Lake Placid, N. Y., June 16-29.

Canadian Electric Association — Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 19-21.

American Society for Engineering Education—Annual Meeting, Cornell University, Ithaca, N. Y., June 17-21.

Wisconsin Utilities Association—Annual Convention, Accounting Section, Kings Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

Michigan Electric Association—Grand Hotel, Mackinac Island, Mich., June 23-26.

American Society of Heating and Air Conditioning Engineers—Semi-annual Meeting, Manoir Richelieu, Murray Bay, Quebec, June 24-26.

AUGUST

• **Western Electronic Show and Convention**—Annual Meeting, Cow Palace, San Francisco, Calif., August 20-23.

American Institute of Electrical Engineers—Pacific General Meeting, Yakima, Washington, Aug. 26-30.

SEPTEMBER

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

• **Instrument Society of America**—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

• **Maryland Utilities Association**—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

• **Edison Electric Institute**—Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25, Meter & Service Committee, Hotel Nicolett, Minneapolis, Sept. 24-26; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

• **Public Utilities Association of the Virginias**—39th Annual Meeting, White Sulphur Springs, W. Va., Sept. 20-21.

• **American Society of Mechanical Engineers**—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

• **American Institute of Electrical Engineers**—Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

• **Electric Companies Public Information Program**—Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

• Additions this week.

R/W Meeting Slated for Electric Companies

The first national gathering of electric company right-of-way men is scheduled for May 15 at Chicago, Ill. Problems and practices in acquiring sites and rights of way will be discussed at the one-day session. The meeting will be held in the Conrad Hilton Hotel. For details write R/W Editor, Electrical World, 330 West 42nd St., New York 36, N. Y.

FRENCH SIMPSON NORMAN WALRAFEN ASHEIM

Black Hills P&L Makes Executive Promotions

In a series of top executive changes, Neil G. Simpson was recently elected president of Black Hills Power & Light Co and J. B. French, his predecessor, was named chairman of the board. In addition, H. E. Norman was elected vice president and treasurer, L. Duane Walrafen vice president and secretary, and R. G. Asheim vice president in charge of operations.

Simpson has been general manager since 1950. He began his career at Black Hills Power & Light in 1937 when, while attending the School of Mines, he worked part time for Dakota Power Co, a predecessor. Two years later, upon graduation, he began full-time employment with the company, first as stores clerk, and then as serviceman, salesman, and office clerk. He was elected a vice president and local manager in Rapid City in 1941 and elected to the board of directors in 1946. At present Simpson is vice president of the Rocky Mountain Electrical League.

French has served as president of BHP&L since he organized the utility in 1941. In his new capacity he will concentrate mainly on long range planning and on the development of Wyodak Resources Development Corp, a subsidiary.

Norman, treasurer for the past three years, has been with BHP&L and predecessors since 1921. Beginning in the company's accounting department, he later rose to local manager at Deadwood and company auditor.

Walrafen, who joined BHP&L as corporate officer in February, 1956, has been secretary since April of last year. He was previously with Kansas Corporation Commission as chief engineer and director of its public utility division.

Asheim, until his present promotion, served as manager of engineering and operations since 1954. He has been with the utility since his 1944 graduation from the School of Mines. His previous positions include engineer, distribution engineer, local manager in Rapid City, and manager of distribution of the utility.

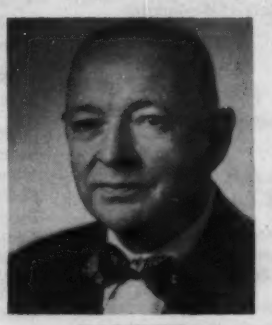
(More News About People—p. 174)

Pacific P&L Ups Mackenzie

Pacific Power & Light Co's board of directors has announced the recent election of George F. Mackenzie to the position of vice president and treasurer.

A veteran of more than 40 years with the Portland (Ore.) utility, Mackenzie most recently served as treasurer, a post to which he was named in 1950.

At the same time the board elected Allan A. Smith general counsel, to fill an existing vacancy on the board of directors. Smith heads the law firm of Smith, Gray, Hill & Rodgers.



MACKENZIE

Milner Named VP-Treasurer

Newly elected vice president and treasurer of Louisville Gas & Electric Co is B. Hudson Milner. He assumes the post left vacant by the recent retirement of John J. McKenna, who had been with the utility for 38 years.

Milner, in accepting his new appointment, will resign as a partner from the law firm of Middleton, Seelbach, Wolford, Willis & Cochran, which serves as general counsel for Louisville G&E. Milner received his law degree from the University of Louisville and is a Princeton University graduate.

MILNER

HOW BELL SYSTEM COMMUNICATIONS SERVE THE POWER INDUSTRY

LILCO's "77 acres of service" at Hicksville—the first atom-age service center—complete from spare parts and weather service to feeding and sleeping accommodations.

Private line channels form nerve system for first atom-age control center in U.S.

Bell System communications help make the Hicksville headquarters of Long Island Lighting Co. self-sustaining. First of its kind in the U. S., the center can control the supply of power to 1½ million people under emergency conditions.

From the underground control center, System Operators control the load at seven generating stations. They also trip and close power switches and monitor the operation of 29 remote substations. This finger-tip control is accomplished entirely over Bell System private line channels.

• • •

Modern communications can give your own operations the same kind of speed, efficiency—the kind that provides good customer service. Just call your Bell Telephone Company business office. A representative will be glad to make a thorough study of your needs.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER CHANNELS FOR: DATA TRANSMISSION • REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

"Our supervisory control system lets us do just about everything at plants and substations but sweep up"—O. H. Nauman, chief system operator.

LILCO's continuous 68-ft. system control board was designed to provide better supervision of an area whose population has jumped 50% in four years, and to function efficiently in time of major disaster.

SPRACKLING KERESEY STEINMETZ ALLEN DI LUSTRO

Anaconda W&C Officials Assume New Posts

William E. Sprackling has been elected president and chief executive officer of Anaconda Wire & Cable Co and H. Donn Keresey was named chairman of the board. New executive vice president is Richard B. Steinmetz. Also advanced were David E. Allen to vice president-sales and Vito F. di Lustro to vice president-manufacturing.

Sprackling, executive vice president since 1947, is also a director of the company. He joined Anaconda in 1929 as a vice president. A Brown University graduate, he is a past vice president of National Electrical Manufacturers Assn.

Keresey has been president since 1929. He began with Anaconda Copper Mining Co in 1918 shortly after graduation from Georgetown University.

Steinmetz, who was advanced from vice president of manufacturing operations, came to Anaconda in 1930. Since then he has also been district sales engineer, sales manager of Marion, Ind., mill, and general manager of mills. He is an electrical engineering graduate of Cornell University.

Allen has been general sales manager since 1952. During his 25-year career with Anaconda he has also been district sales engineer, district manager, assistant chief engineer, and sales manager.

Di Lustro, most recently general manager of mills, has also served as manager of the Hastings-on-Hudson Mill and assistant general manager of mills.

Sangamo Elevates Lanphier

LANPHIER

Sangamo Electric Co has appointed R. C. Lanphier, Jr, to the newly created post of vice president and director of sales.

In this capacity Lanphier will co-ordinate all of Sangamo's domestic sales, marketing, and promotional activities. He will also direct Sangamo International, Inc.

A 25-year Sangamo veteran, Lanphier has been on leave of absence for the past three years while serving as deputy assistant secretary of defense for supply and logistics, Department of Defense. He has been vice president-manufacturing since 1939.

PERSONAL BRIEFS

Edmund J. Thimme has been elevated to general superintendent of electric distribution of Public Service Electric & Gas Co. The department also advanced **George E. Dean** to transmission and distribution engineer; and **Oscar Bauhan** and **James A. Pulsford** to assistant transmission and distribution engineers. **Hollis K. Sels** becomes system planning and development engineer to head the new system planning department and **Robert G. Hooke** is assistant system planning and development engineer. **D. C. Allen** is industrial relations manager.

Gulf States Utilities Co ups **George W. Dunlop** to assistant treasurer to head the new systems and procedures department. New assistant treasurer in charge of accounting is **E. L. Bailey.**

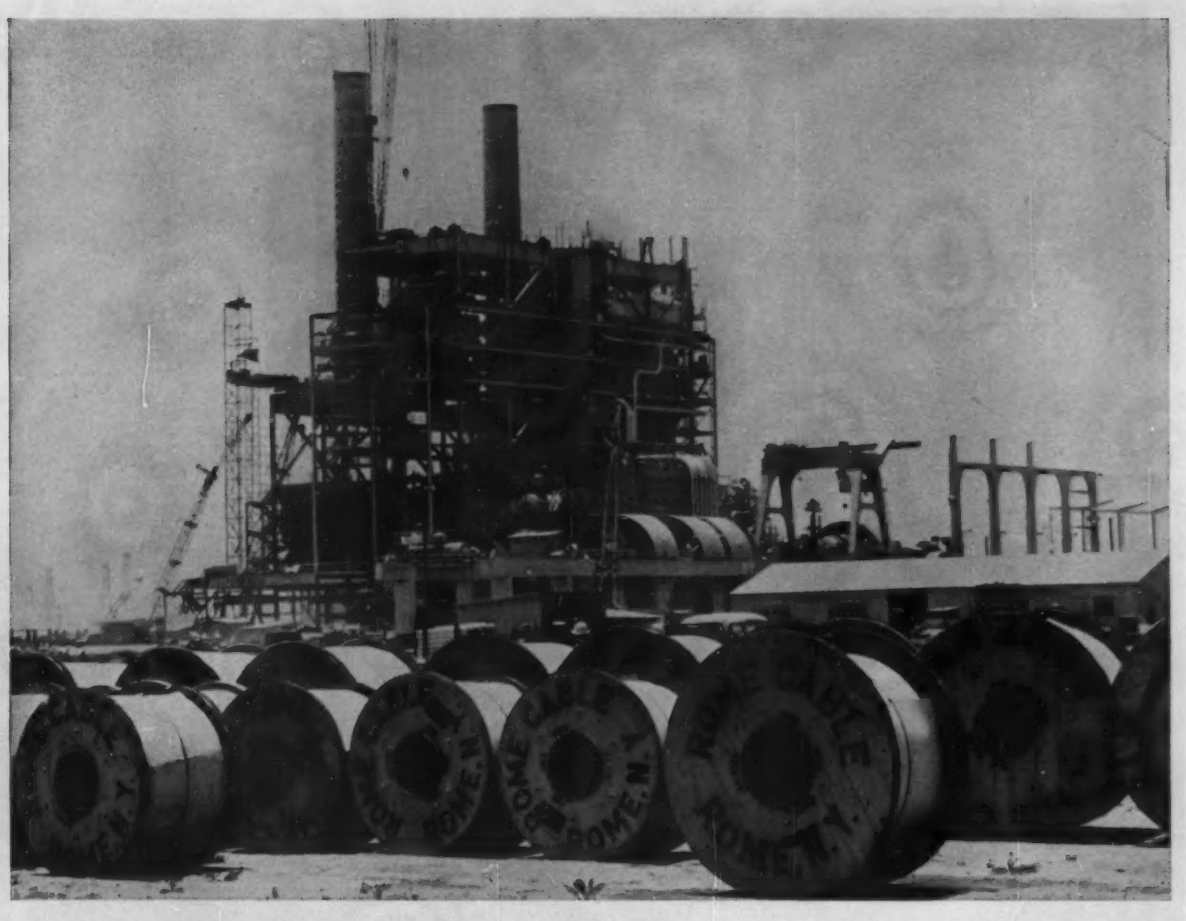
Southwestern Gas & Electric Co's **Marvin Murphy** is new Fayetteville Division manager . . . **Lowell Gamble** joins Montana-Dakota Utilities Co as assistant to the vice president on rates, insurance, and taxation.

Atomic Energy Commission has named **Dr Paul C. Aebersold** assistant director for isotopes and radiation, Division of Civilian Application . . . **Lynn K. Hurst** is newly appointed director of special materials and services division, Argonne National Laboratory.

The South's recently formed Regional Advisory Council on Nuclear Energy has as its new executive secretary **G. O. Robinson** of AEC's Savannah River operations office.

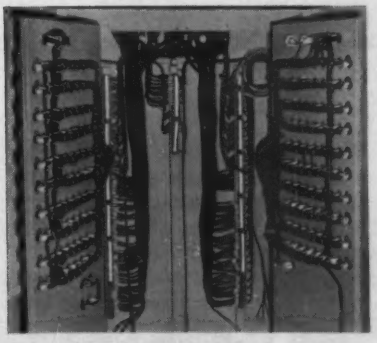
Clarence E. Archer has been named to succeed **L. E. Turner** as manager of Appalachian Electric Power Co's Glen Lyn plant.

(More Personal Briefs on page 178)



Southern California Edison installed . . .

¼ million feet of Rome control cable in new Alamitos steam station



EASY TO HANDLE, STRIP, SPLICE. The clean, low-friction surface of Rome's control cables enabled Alamitos workmen to pull the cable through conduits and into this cabinet quickly and easily.

For its station control circuits, this large West Coast utility selected high-quality Rozone-Roprene control cable —*253,000* feet of it. This Rome cable is a logical choice for any such permanent installation since it represents the ultimate in control cable design and performance.

Built to last. Each conductor is insulated with a premium-quality, oil-base insulating compound—Rozone—which provides excellent protection against corona and ozone cutting. Rozone is also highly resistant to water and aging. Each individual conductor is then covered with a tight-fitting color-coded Roprene (neoprene) sheath.

Over-all protection is provided by a Roprene jacket, which not only resists weather, oils, chemicals, and even flame, but also provides a high resistance to mechanical injury during and after installation. And this tough Rome Cable material is virtually immune to corrosion and electrolysis.

If you want the very best in station control cable for your next job, specify Rozone-Roprene. Contact your nearest Rome Cable representative for more information—or write to Department 803, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

Easier to Handle. The lightweight construction of Rome's aluminum Triplex makes it easier to handle and quicker to install than open-wire drops.

Neater Appearance. This self-supporting service drop cable offers neat appearance of a single cable assembly compared to open wires.

Rome's lightweight aluminum Triplex goes up

Some of the other benefits provided by this service cable

The construction features of Rome's aluminum Triplex lead to still more savings:

Costs less. Initial cost is lower than conventional copper Type SD service drop cable.

Lasts longer. Maintenance and service interruptions are few compared to open-wire installations. It offers maximum resistance to storms, wind, and ice loading.

Fewer poles required. Fewer poles are required and longer spans are possible with mid-span taps on secondary Triplex.

Less hardware needed. Service tap connections at the pole require less hardware than a conventional three-wire tap.

You have a choice of Roprene (neoprene) or Rolene (polyethylene) insulation. Either one withstands the severe effects of sunlight, heat, moisture, corrosive atmosphere, and other common hazards.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information —or write to Department 366-A.

much faster than open-wire service drops

That means real savings in on-the-job manpower costs

Reduce your service-drop installation time—even by a few minutes—and you save money. Now it's possible to speed up practically every job.

High dollar savings. Rome's aluminum Triplex can be installed much faster than open-wire service drops. Multiply the time it saves by the high cost of keeping your crew on the job, and you'll see how great the savings are in manpower costs alone.

Why such savings are possible. The lightweight construction of Rome's aluminum Triplex is behind these important savings. This single cable assemby weighs less than conventional copper three-wire service drops, so it's easier to handle and quicker to install.

Rome's aluminum Triplex offers simplicity in construction. A self-supporting cable, it consists of specially insulated power conductors spiralled around a "straight-away" neutral conductor. Less handling is required to pull it off the truck, string it, and connect it than conventional three-wire service drops.

You can purchase this economical service drop cable in handy 500-foot cartons, paper-wrapped coils, or on non-returnable reels.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 366-A and ask for Bulletin RS-5. Rome Cable Corporation, Rome, New York.

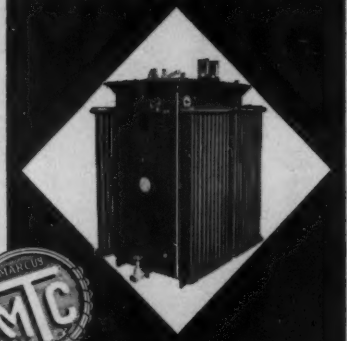
ROME CABLE
CORPORATION

DID MACY'S TELL GIMBELS

about those wonderful MARCUS transformers

We don't know . . . but both of these nationally famous department stores use Marcus Transformers for power and lighting distribution.

Marcus "Mark of Quality" transformers GUARANTEE trouble-free service and safe, dependable operation. For bigger profits and greater customer satisfaction, use MARCUS for your next installation.



MARCUS TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY

Representatives in Principal Cities

"Mark of Quality"

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

in a FIX for FITTINGS?

standards or specials . . . get them faster from

PLM

• Wet locations . . . dry locations . . . for terminations with potheads or without them . . . whatever your needs for armored cable terminating fittings or splices may be, you'll find answers, *fast*, from PLM.

PLM Catalog 301 lists and illustrates fittings for all types of installations to 15 kv, to meet standard as well as special requirements. Listed also are PLM Splicing and Terminating Kits to speed up the job . . . insure complete, correct materials for every armored cable splice and termination, as well as for splices in non-metallic and lead-covered cable. Ask for your copy.

PLM PRODUCTS, INC. • 3873 West 150th Street • Cleveland 11, Ohio
WIRE AND CABLE FITTINGS AND ACCESSORIES

Personal Briefs

(Continued from page 174)

Westinghouse Electric Corp has designated **Edward P. Subler** as assistant to **J. J. Anderson,** manager of the Major Appliance Division . . . **John G. Wynn** is new executive staff assistant at general products headquarters. He succeeds **John C. Feick, Jr,** now assistant to the vice president, Air Conditioning Division . . . **Floyd H. Geyer** becomes area sales manager and **Roy D. Call** engineering and service manager of the firm's apparatus sales office in Cleveland . . . Industrial Heating Division's new Pacific Coast branch in San Francisco appointed **R. R. LaPelle** manager, and **Wallace B. Dugan** design engineer. In Los Angeles are **Donald P. Hoover,** industrial heating product engineer; **C. Kenneth Massey,** sales engineer; and **William A. Emerson,** induction heating engineer.

Union Carbide Corp has elected **A. Lyndon Foscue, Birny Mason, Jr,** and **Edwin B. Suydam** vice presidents and appointed them members of the appropriations committee . . . The company's Silicones Division has three new product managers. They are **T. F. Hart,** silicone resins and sizings; **M. H. Jellinek,** silicone specialties; and **R. S. Wishart, Jr,** silicone fluids.

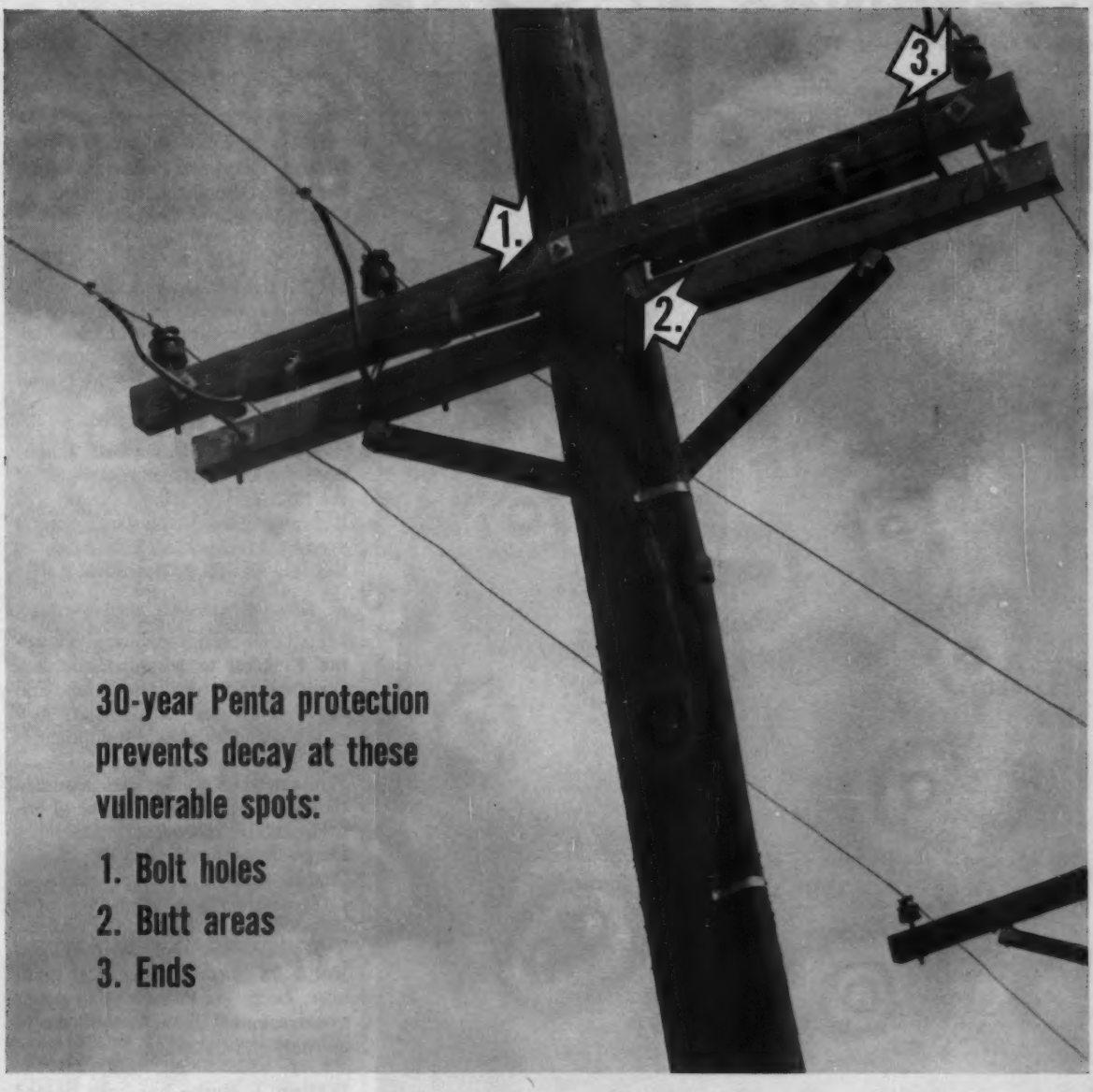
Frederick E. Stote is new manager of manufacturing of Federal Telephone & Radio Co's Semi-Conductor Division, and **Abe Rakoff** becomes the division's manager of quality control.

K. C. Flory has been named assistant to the director of the Industrial and Community Relations Division of Allis-Chalmers Manufacturing Co.

George F. Paterson has been appointed to succeed **E. Norman Bowry,** retired, as director of purchasing, Simplex Wire & Cable Co.

Olin Mathieson Chemical Corp recently named **Fred H. Edgar** as sales manager of Detroit-Cleveland Division for Olin Aluminum . . . **R. K. Annis** has been appointed development engineer of Fairbanks, Morse & Co.

(Continued on page 180)



Cut replacement costs...make your whole pole plant last longer with clean Penta-treated crossarms!

Doesn't it make good sense, in view of rising crossarm installation and replacement costs, to use Penta-treated crossarms *as well as Penta-treated poles.* By using Penta-treated crossarms, your whole pole plant is assured maximum in-service life and freedom from periodic, costly maintenance and replacement.

Penta-treated crossarms last 30 years and longer. They're immunized against decay—especially where it is most likely to occur—at bolt holes and where arm butts pole. Penta also holds end-fraying in check.

Easy to handle. Penta-treated crossarms . . . and poles . . . are clean, easy to handle. Won't "burn" hands, stain clothing. Installations go up fast.

Specify Penta! Your near-by treating plant is equipped to supply *all* your Penta-treated forest products needs for crossarms, poles, transformer platforms, braces, planking. Write us for your list of treating plants and your informative copy of "Poles and Crossarms."

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Dept. PI-13, St. Louis 1, Missouri

MONSANTO

WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

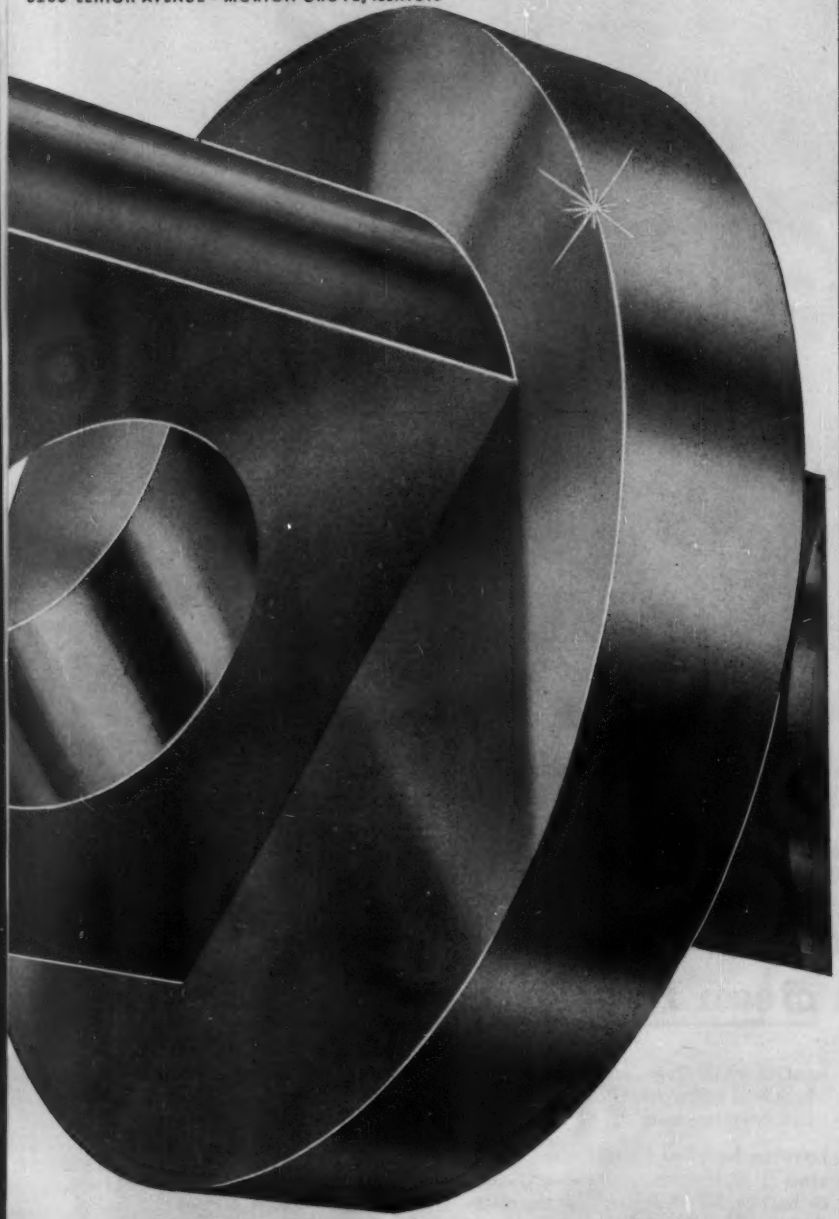
CORROSION-RESISTANT
FASTENINGS
with High Safety Factor

Strict adherence to specifications, interchangeability, dependability, and long service life—these are inherent characteristics of Harper Corrosion-Resistant Fastenings—the accepted standard in the electrical field.

IMMEDIATE DELIVERY FROM DISTRIBUTOR'S STOCK

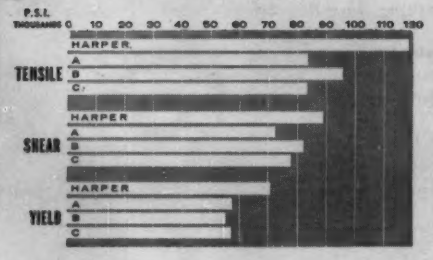
THE H. M. HARPER COMPANY
8205 LEHIGH AVENUE • MORTON GROVE, ILLINOIS

HARPER®



Laboratory tests prove greater strength of Harper stainless steel machine bolts

Independent laboratory tests* on stainless steel machine bolts produced by The H. M. Harper Company and three other leading producers of fastenings, prove Harper superiority in Yield, Tensile, and Shear Strength. Chart shows the actual results of these tests . . . irrefutable proof of Harper superiority! For complete details request Form No. 126.
*By R. W. Hunt Laboratories



Personal Briefs

(Continued from page 178)

The newly created position of assistant to the president of Crouse-Hinds Co has been assumed by **John B. Crosby.** Replacing him as advertising manager is **Cornell B. Blanding.**

M. F. Beisber, in addition to his duties as director of market research and distribution for Line Material Industries, has been appointed marketing consultant of McGraw-Edison Co.

Bakelite Co's **L. D. Burnett, Jr,** has been named assistant manager of the Film and Sheeting Division . . . Recently named assistant general product manager of Polyolefins at Bakelite was **R. P. Bowditch.**

Radio Corp of America's Components Division has advanced **Thornton F. Scott** to administrator, advertising and sales promotion, and **Jay J. Newman** to manager, new product and market development.

William M. Paradise has assumed the post of purchasing agent of International Business Machines Corp's new Burlington, Vt., manufacturing plant.

International Harvester Co's Motor Truck Division recently promoted **Ralph M. Buzard** to general manager, **Louis W. Pierson** to manager of sales, and **William E. Callahan** to assistant sales manager.

William J. Burke has been named to head the new industrial relations department at Pacific Coast Engineering Co.

OBITUARY

Wilbur S. Holton, 52, vice president of Orangeburg Manufacturing Co, Inc, died recently following a heart attack.

Cathrae M. Laffoon, 68, retired manager of Westinghouse Electric Corp's generator engineering department, died recently. He was awarded the Lamme medal as the outstanding electrical engineer of the year in 1950.

SALES ASSIGNMENTS

COMPANY STAFFS

Elliott Co has appointed Charles L. Hoebel district manager of the New York office.

Enjay Co, Inc, has designated T. Curry Jones as manager of the new mid-Atlantic sales district.

Federal Pacific Electric Co's Virginia branch has as its new manager Gordon E. Granger, Jr.

General Cable Corp's R. J. Fitzgerald has been appointed manager of the Philadelphia sales office to succeed M. J. A. Dugan.

General Electric Co's recently established South Atlantic sales district, user industries sales department, has named J. Frank McElwee, Jr, manager . . . New Southeastern district manager for the department, with headquarters in Atlanta, Ga., is R. H. Jackson.

Gould-National Batteries, Inc., has appointed S. V. Malin as district manager of its Industrial Division, with headquarters in Detroit.

Minneapolis-Honeywell Regulator Co's Richard DeStefano has been named to direct nationwide sales of the firm's proximity switches.

Pacific Coast Engineering Co has named Olaf W. Olsen as assistant general sales manager.

Radio Corp of America's Commercial Electronic Products has named F. T. Daly as East coast and Southeast sales representative for microwave equipment and systems, communications products department.

Westinghouse Electric Corp has designated William B. Beggs as assistant to the sales manager of the Atlantic region and Donald M. Canfield as assistant to the sales manager of the central region of the company's Lamp Division.

Unistrut Products Co has designated Clem Kopf as manager of its distributor organization, Unistrut Philadelphia.

REPRESENTATIVES

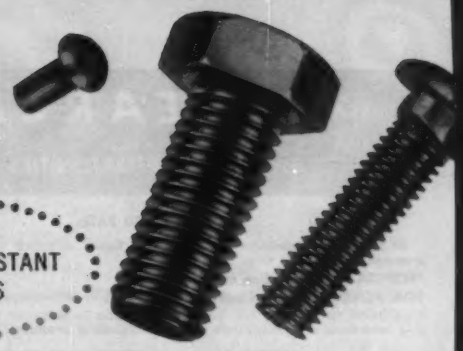
Automatic Switch Co has appointed Industrial Engineering Equipment Co of Davenport, Iowa, as authorized stocking distributors of Asco solenoid valves.

Dow Corning Corp has named C. E. Riggs, Inc, as a distributor to the electrical industry for Dow Corning silicones in the Portland, Ore., area.

Four Wheel Drive Auto Co has designated Glenn Dick Equipment Sales, Inc, of Boise, Idaho, as a sales, parts, and service dealer for central and southern Idaho.

HARPER®

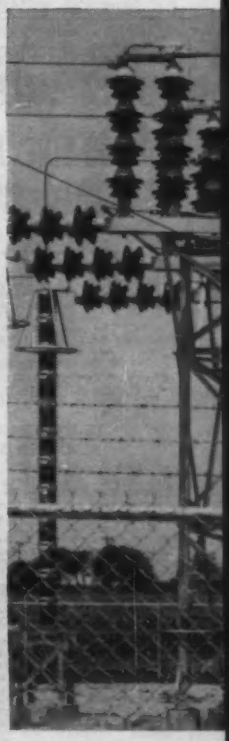
CORROSION-RESISTANT FASTENINGS



WHAT SPECIAL PART DO YOU NEED?

Let Harper Flo-Form save you time, money, metal!

Only Harper, with its vast experience in corrosion-resistant fastenings, could develop Flo-Form—the copyrighted name for an exclusive process that turns out problem specials *better, faster,* and at *lower cost!* Call your nearby Harper Branch and outline your *"special problem"* to a Harper Application Engineer. See how quickly the team of Harper engineering, metallurgical, and tooling specialists speeds the right answer to you. See how Harper Flo-Form produces a cleaner, stronger, better special . . . faster . . . at lower cost! Draw upon our thirty-three years of know-how. Send your problem to The H. M. Harper Company, *today!*

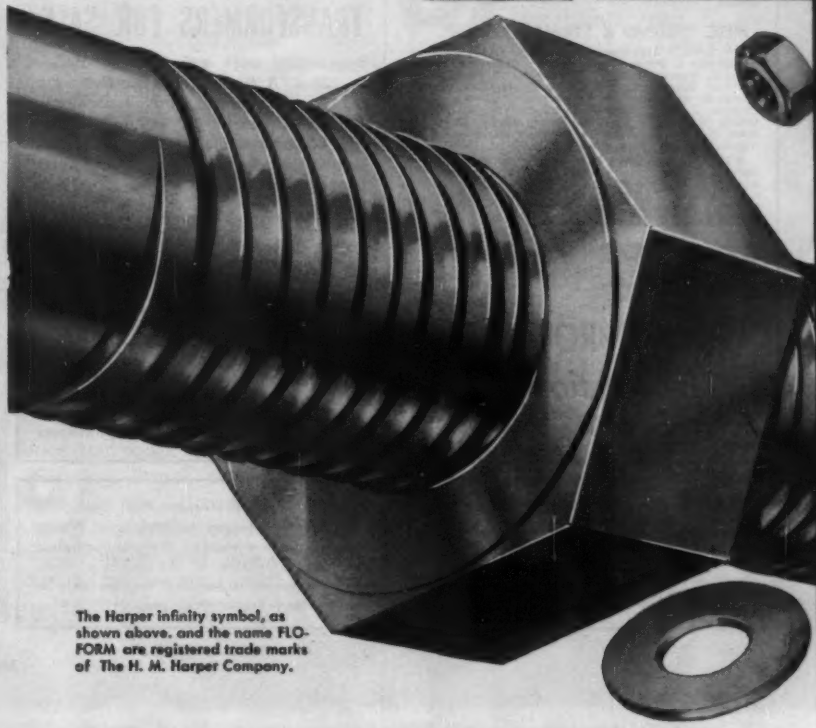


THE H. M. HARPER COMPANY

8205 LEHIGH AVENUE • MORTON GROVE, ILLINOIS

Meet Harper Application Engineer, WILL BOYES

From Rochester, serving busy Western New York State and the Province of Ontario, you'll find Mr. Boyes. Will is another example of Harper Flo-Form Engineering Service which brings to design and production engineers the experience and know-how that solves special fastening problems.



The Harper infinity symbol, as shown above, and the name FLO-FORM are registered trade marks of The H. M. Harper Company.

CLASSIFIED **SEARCHLIGHT SECTION** ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line on insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

SEND NEW ADVERTISEMENTS TO Classified Advertising Div. of ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

AN AUCTION

HIGH-LINE EQUIPMENT

SATURDAY, JUNE 8, 10 A.M.

GENESEO, ILLINOIS

LOCATION: The equipment yard of the Edwards Construction Co., at 114 N. Williams St. (4 blocks E. of business district). Geneseo is 18 mi East of Moline or 150 mi West of Chicago on US Hiway 6. NOTE: The Edwards Construction Co. is quitting the High-Line, Sub-Station and Distribution Contracting business and selling all equipment. Most is just off the job and very good.

EACH PIECE POSITIVELY SELLS TO THE HIGHEST BIDDER WITHOUT LIMIT, MINIMUM OR RESERVATION!!!

TRUCK CRANE-TRACTOR MOUNTED EQUIPMENT

Shield-Bantam T-35 Truck Crane, on GMC 200 6x6 Carrier, new in '54 & very good; Insley K-12 Shovel; Cat D-4 with Braden DD Winch & 'A' Frame, very good; New Cat D-4-44" Angledozer Attachment; AC HD-10 with two Winches & 'A' Frame, very good; Cat D-2 with Highway HD Earth Auger, Winch & Derrick, dug less than 600 holes; Hough HF Payloader, Excellent; LaPlant-Choate C-40 Hyd. Scraper & Control, very good.

TRUCK MTD EQUIPMENT—TRUCKS—TRAILERS

'52 Ford F-6 M-H 4x4, with HD Earth Auger, Winch, very good; '42 Ford M-H 4x4, with Winch & 'A' Frame; '54 Ford F-8 Tractor; '51 IHC L-195 Tandem Tractor with Winch & 'A' Frame; 1956 Transport 24 T tandem Lowboy, excellent; Fruehauf Office-Tool-Van; 2 Tandem Pole Trailers; Pole Dollies; Stringing Carts; Chev. & IHC flat dumps; Chev. Ford & Dodge Line Trucks; Utility Trucks; '56 Chev Handyman; 10 Pickups to '56; Others.

MISC. DIGGING & STRINGING EQUIP.

Ditch-a-Witch Trencher; Wire Carts; Chain Saw; 6 Highway & Penge Augers to 32"; Sauerman DD Hoist & Crescent Bucket; New Jaeger 2" Pump; 2 Foochay Diggers; 2 Onan Lite-Plants; 500 new Campbell Stringing Blocks; Winches; 3 Hydro-Presses; 2 RCA 2-way Radios; Hot Sticks; 300 Grips; 60 Coffing Hoists; 50 Snatch Blocks; Quantities of hand tools, rubber goods, misc. items & supplies; Many many other items.

WRITE-WIRE-CALL Auctioneers for sale bill. INSPECT any time. TERMS: Complete Payment Sale Day: Certified Checks, Cashier's Checks, Letters of Credit. EACH PIECE POSITIVELY SELLS TO THE HIGHEST BIDDER WITHOUT LIMIT, MINIMUM OR RESERVATION!!!

EDWARDS CONSTRUCTION CO., owner

Geneseo, Ill. Ph: 2011

FORKE BROTHERS

The Auctioneers

321 Sharp Bldg., Lincoln, Nebraska

LARGE POWER EQUIPMENT

Prompt Stock Shipment

REBUILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?

BELYEA COMPANY, INC.
51 Howell St. Jersey City, N. J.
OL. 5-3334

FOR SALE

One (1) Four Wheel Drive Line Construction and Maintenance Truck with 6 man crew compartment line body and pole raising equipment.

Model HRU—1946 Mileage: 57,700
Wheel Base—170"
Tires—Dual Rear 900 x 20
Engine No. 68482—Model 6M2A-34
Serial No. 112422
Weight including truck, body and basic equipment approximately 21,300 lbs.
Winch—2 drum 20,000 lbs.
Body—American Coach
Derrick—T Type—has set up to 60 ft. poles
PRICE $2,000.00
Cash on delivery driveway—Fairmont, West Virginia

MONONGAHELA POWER COMPANY
Purchasing Department, Fairmont, W. Va.

FOR SALE
Subject to Prior Sale

1750 feet, G.E.
15 KV AERIAL CABLE

3/C #2 (19/.0391") coated copper, semi-con. tape, 19/64" Super Coronal tape, tapes 5/64" Goeprene, cabled and bound to a 1½" EHS 30% copperweld messenger for 15 KV grounded neutral service. 6 only #T17831-3D, G&W 1 conductor 15 KV pothheads. If interested contact N. C. Stirewalt, V.P.,

Central Illinois Public Service Co.
Springfield, Illinois.

TRANSFORMERS FOR SALE

Reasonable price will be negotiated—9—200 KVA General Electric Company old, but maintained in good condition, 4000 volt primary—230/460 volt secondary, oil-immersed type H single phase. Immediate delivery from California. Phone or write H. A. Sawin.

YUBA MFG. CO.
701 E. H Street Benicia, Calif.
Telephone Benicia 628

3—167½ KVA Westinghouse 13.2—2400/4160
3—100 KVA Wagner—2400/4160—13.2
3—100 KVA Wagner—2400/4160—7200/12470Y
3—G.E. Induction regulators—25 KVA, 2400/4160 32 step with 10+10 voltage regulation

All of these transformers are only four or five years old and in excellent condition.

Contact Board of Public Works, Auburn, Nebraska c/o Lambert Blecha, manager.

ANYTHING within reason that is wanted in the field served by Electrical World can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

EMPLOYMENT OPPORTUNITIES

ELECTRICAL and MECHANICAL ENGINEERS

Consumers Power Company, a growing electric and gas company which serves the lower Michigan area, has positions available for qualified engineers. These positions are in electric distribution, substation design, overhead and underground lines, system planning and general gas engineering.

Consumers Power Company offers good salaries and excellent opportunity for advancement. Liberal hospitalization and life insurance policies, pension plan, an excellent sick leave program and paid vacation plan are but a few of the fine employee benefits offered to you.

Here is your opportunity to work and progress with an expanding utility company. Send a resume of your education and experience to **Mr. R. E. Beatty, Consumers Power Company, 212 West Michigan Ave., Jackson, Michigan.**

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Electrical Designers—Top Salary, Scheduled Overtime at Time & One-Half Rates. Immediate Openings. Permanent Positions. Paid Holidays & Vacations. Experience required in Power Plants and Industrial Buildings. . . Marbarry Corp., 120 Greenwich St., N. Y. 6, N. Y. REctor 2-3749.

Assistant Vice President—For firm in Fairfield County, Connecticut. Must be thoroughly familiar with public utility field, including operations. To evaluate operating methods; handle preliminary development of construction and operating budgets; help analyze rates, supervise new rate studies, and act as witness in preparation of rate cases for public utility commissions; handle labor contracts and negotiations. Must be an electrical engineering graduate. Age: 35-45. Salary: to $15,000. P-5044, Electrical World.

BOOKS AND PERIODICALS

A.I.E.E. Transactions wanted to buy for cash and other technical and scientific periodicals. E. W. Ashley, 27 E. 21, N.Y.C. (10).

EMPLOYMENT
(Continued)

SALES ENGINEERS
(4 REQUIRED)

Prefer graduate Electrical Engineer with at least five (5) years experience in Electrical distribution, or fuse cutouts and lightning arrester design or application.

Man desired must be of good character. Work involves sales engineering on cutouts and lightning arresters. Position will require traveling.

Compensation commensurate with experience and ability. Positions afford real opportunity for advancement. All communications held strictly confidential.

Send resume to C. H. LeVee
Hubbard & Co., 5401 W. Roosevelt Road
Chicago 50, Ill.

ELECTRICAL ENGINEER

Electrical Engineer interested in electrical design of power plants or industrial plants. Experience not required.

Excellent opportunity with consulting engineering firm in Middle West. Liberal benefit plans and good working conditions.

Send resume of education and experience with statement of salary requirements to:

P-3234, Electrical World,
520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL DESIGNERS

Conduit and physical layout men. Control and wiring exp. desirable but not necessary. Work in air conditioned offices of a leading hydroelectric consultant in Chicago. Good starting salaries and liberal fringe benefits. Challenging work and opportunity for advancement. Please send complete resume to Hugo Niemi, Personnel Manager

HARZA ENGINEERING CO.
400 West Madison Street Chicago 6, Ill.

Don't forget the
BOX NUMBER

When answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

READERS FORUM

Auto Transfer Finds Staunch Supporters

(Comment on "Automatic Transfer of Power Plant Auxiliaries Shown Unnecessary," EW, Feb. 18, p 84)

To the Editor:

In the Feb. 18 issue you published an article by your C. F. Hochgesang stating that automatic transfer of power plant auxiliaries to standby sources is unnecessary.

We cannot agree even though boilers and turbine generators are designed for safe shutdown without available auxiliary power.

Regardless of reason for shutdown, immediate power restoration has benefits not mentioned. If the shutdown cause is transient, the unit can be returned much quicker if auxiliaries are transferred automatically rather than manually. If auxiliary burden becomes too great, non-essentials can be dropped during transfer.

Manual restoration of auxiliary power throws undesirable burden on the control operator. Added cost of autotransfer is so small that it is certainly justified.

A. W. Walton
Asst Supt of Generation
Oklahoma Gas & Electric Co
Oklahoma City, Okla.

To the Editor:

We provide automatic transfer without increasing breaker interrupting rating and without providing lower than standard impedance auxiliary transformers which are the only two items that could involve any appreciable dollar value. There are no control complications as our automatic instantaneous transfer involves only adding a few interlocking auxiliary contacts with existing master trip relays.

The author has assumed that it is necessary to delay transfer until voltage decay on the auxiliary bus is 25% of normal in order to reduce the shock to motors because of heavy inrush currents. It has been our and other utilities' experience, proven by oscillograph records of actual tests, that no unusual motor troubles are caused by eliminating this decay period for the infrequent occasions this occurs automatically.

Adding additional duty on an operator is questionable because of usual urgency when such an event does occur, the general confusion as to the cause of such a trip, and the necessity to remedy and restore service as soon as possible. Any function which can be made automatic and relieve him of this responsibility and thought is of definite advantage. If the unit is tripped under load, the boiler can possibly be safely brought down to no steam flow without auxiliary power; but this would be subjecting it to shock of a very serious nature.

The statement is made that automatic transfer would impose 100% overload on the standby transformer. Such overloading on infrequent occasions for a short period should result in no damage to the transformer.

Walter B. Morton
Electrical Engineer
Pennsylvania Power & Light Co
Allentown, Pa.

• EW's Fourth Study of Steam Station Design (Oct. 15, 1956) listed 67 new plants, with 52 reporting plans for use of auto transfer.

A Request from Britain

To the Editor:

On page 60 of the March 4 issue I noticed that your magazine has an industry news note service for house organ editors. I was wondering if you could put me on your mailing list.

S. Robinson
"Aeratopics"
N. W. Electricity Board
Manchester, England

• Editor Robinson is referring to "Industry Notes from Electrical World" now carried by the house organs of over 50 U. S. electric companies.

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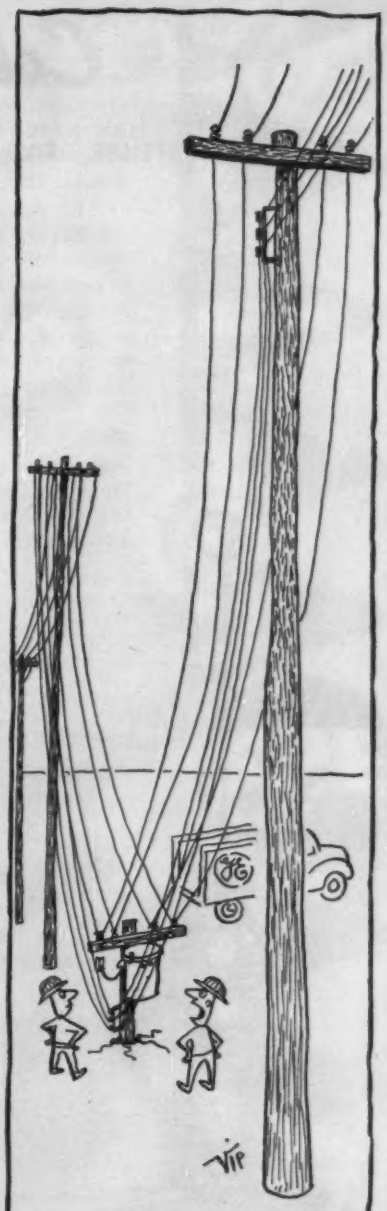

"I guess you'll have to uprate it; it must have been carrying more than its load!"

Do you have overloaded distribution transformers? Call a General Electric Apparatus Service Shop. The shop can uprate your old transformers in both kva and voltage for about two-thirds the cost of new transformers . . . can also convert to self-protected type. And you get new-transformer warranties. Call your G-E Apparatus Service Shop or Sales Office.

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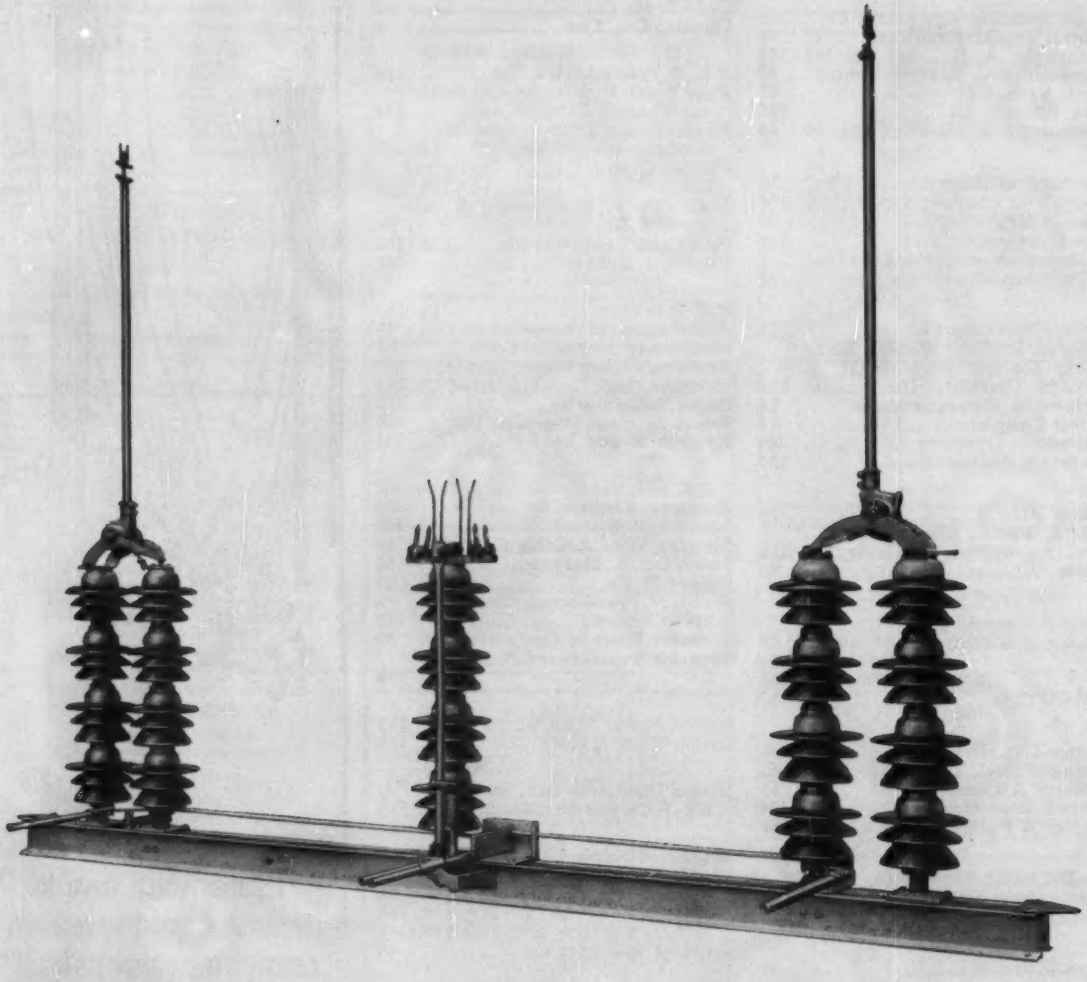

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Vertical Break—Triple Pole—Single Throw—Selector Group Operated
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See Bulletin 46-A

The Girdler Company selects

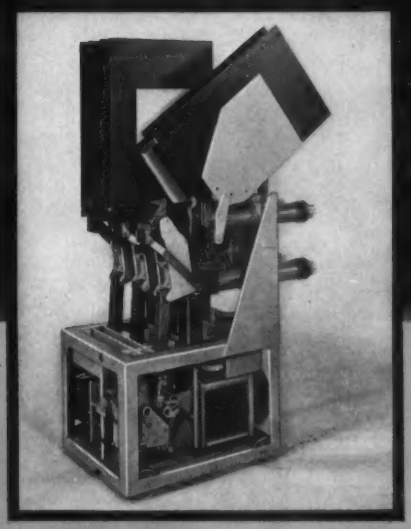
FEDERAL PACIFIC METAL-CLAD SWITCHGEAR

for Southern Nitrogen Company Plant

When it came to the electrical distribution system for its new Savannah plant, Southern Nitrogen Company, Inc. installed Federal Pacific protective and control equipment...as so many other progressive manufacturers are now doing.

The Girdler Company, engineers and contractors for the project, provided rather strict specifications. Control of 3,000 and 5,000 hp nitrogen compressor motors, for example, is through 5-kv, 250-mva Federal Pacific air circuit breakers. Ample reserve capacity, maximum safety, assured service continuity, and minimum maintenance were among the requirements.

To meet these stringent demands, Federal Pacific furnished high-voltage motor starters, oil filled transformers, low-voltage switchgear as well as metal-clad switchgear for motor-starting service and feeder circuit protection.



Advanced 5-kv 250-mva magnetic air circuit breaker used in Southern Nitrogen installation.

The metal-clad switchgear, using 5-kv 250-mva magnetic air circuit breakers of advanced design, has every provision for safety, positive protection, and ease of maintenance. Completely assembled, wired and adjusted at the factory, Federal Pacific metal-clad switchgear is thoroughly tested before shipment. The utility supplying power to Southern Nitrogen is Savannah Electric and Power Company.

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"It's a real pleasure to introduce to you the new Kuhlman low voltage connector for either aluminum or copper conductors.

"As you know, aluminum conductors cold flow more than copper when first connected to a transformer terminal. Then in normal operation they tend to loosen. A common solution is to increase the resiliency of the connector by adding a spring device. I consider the new Kuhlman connector, however, a much simpler, more efficient design. Here's how it works:

"First, when tightened, the eye bolt piece (shown as c above) stretches to accommodate the conductor and through inherent resilience holds the conductor firmly in place. Second, a greater contact surface (a) and (b) is provided for the conductor—particularly important for aluminum. Together, points (a), (b) and (c) maintain a firm contact under all operating conditions without over-stressing the conductor —whether copper or aluminum.

"The new Kuhlman connector is just one more example of how Kuhlman engineering aids the progress of your industry —in this case the recent trend to aluminum conductors. Write today for interesting two-volume story on transformer connectors appearing in present issues of our *Kuhlman Kurrent* house organ."

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